

Protocol - Measurements

A) Measurements at **Ageing** Region and **Reference** Region
(Before, Intermediate, After)

Measurement	HV bias	Light source	Light spot	Details	Instrument
PDE SCAN	ROP	pulsed Laser $\lambda=0.15$ W.P.4, OD2	focused	2 horizontal+2 vertical scans 10 mm with 0.5 mm steps (20 points x 4 scans)	Digitizer
QE SCAN	-50 V at PC EntryMCP at G	Continuous LED Direct $I_{SET}=300$ mA	focused	4x4 pads 0.3 mm steps (100 points/ pad)	i) Keithley EntryMCP, ii) PA120 iii) Keithley PD
Average QE	-50 V at PC EntryMCP at G	Continuous LED Direct $I_{SET}=300$ mA	defocused	1.5 hours (??) 5 OFF - 4 ON states(??)	i) Keithley EntryMCP, ii) PA120 iii) Keithley PD
Gain	ROP	pulsed Laser $\lambda=0.01$ W.P.5, OD3	focused	16 charge spectra for 16 pads Central 4 + adjacents	Digitizer
DCR	ROP	X	X	16 pads; 3 Th (-6/-10/-15 mV)	elX modules
APR	ROP	pulsed Laser $\lambda=3$ W.P.3, OD1	focused	200 ns time window Logic: Enea	Digi/scope?

Protocol - Ageing

→ 10^{14} γ / cm^2 in 10 days

→ 10 hours per day

$$\Phi \text{ (per cm}^2\text{)} = \frac{10^{13}}{10 \times 3600} \text{ per sec.}$$
$$\approx 2.77 \times 10^8 \text{ per sec.}$$

$$r_{\text{spot}} \approx 5.32 \text{ mm}$$

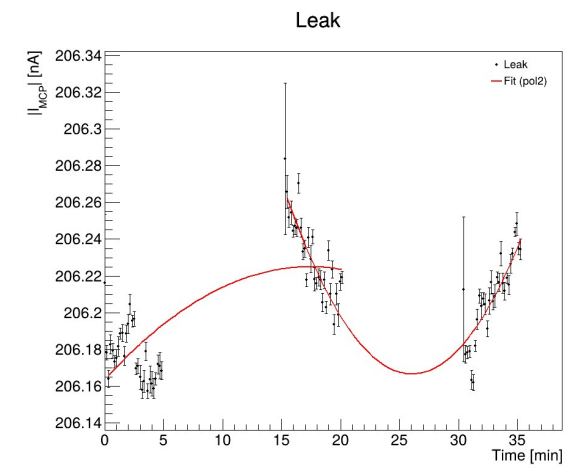
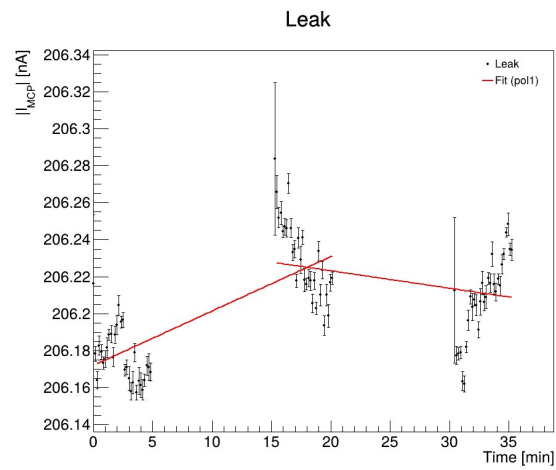
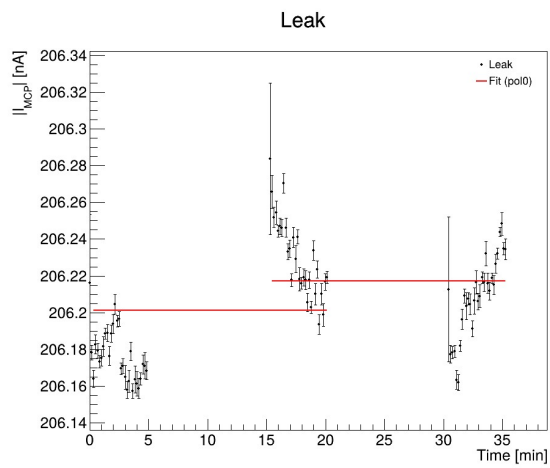
$$\text{Area} \approx 0.89 \text{ cm}^2$$

$$\Phi_{\text{equivalent}} \approx 2.47 \times 10^8 / \text{sec.}$$
$$= \Phi_T \text{ (Ageing)}$$

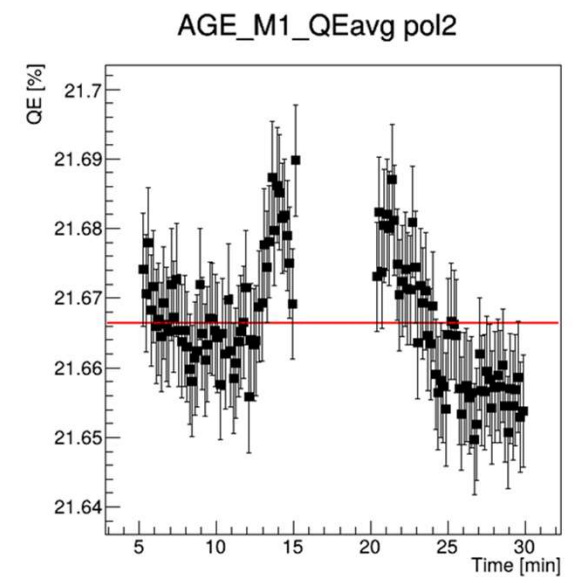
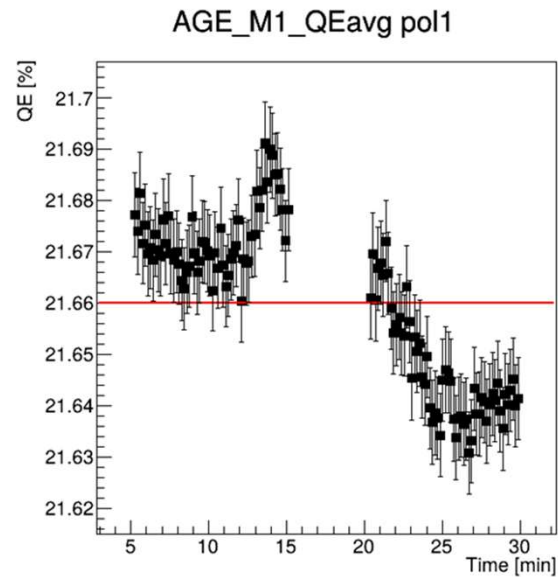
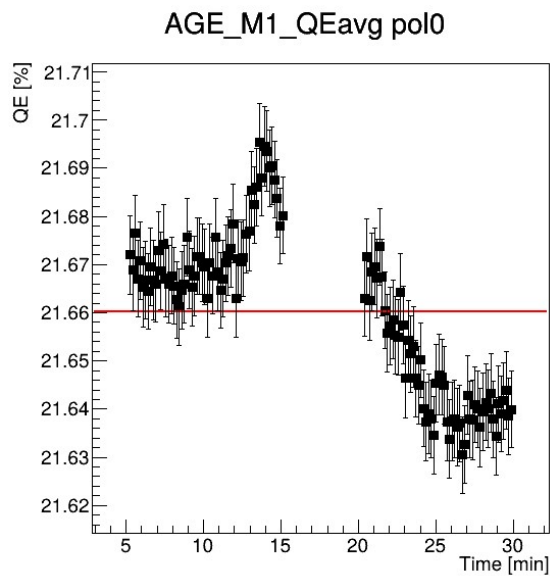
$$20 \text{ pA} = \frac{2 \times 10^{-11}}{1.6 \times 10^{-19}} \Rightarrow \frac{1.25 \times 10^8}{0.565} * 1.13 = 2.5 \times 10^8 \gamma/s$$

$$\frac{2.5 \times 10^8}{0.89} = 2.8 \times 10^8 \gamma \text{ cm}^{-2} \text{ s}^{-1}$$

MCP Current leak

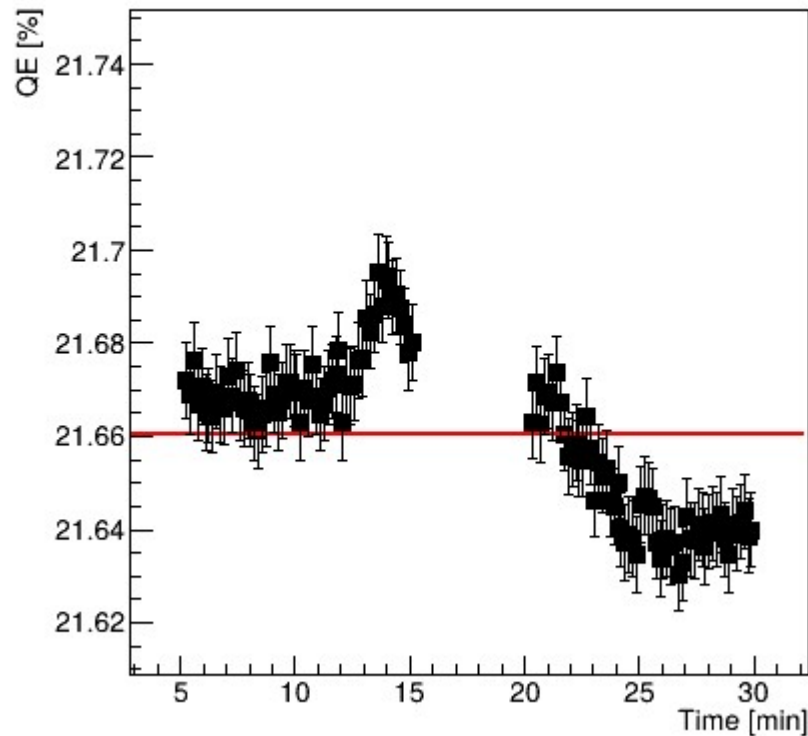


Resulting QE from various leak fits

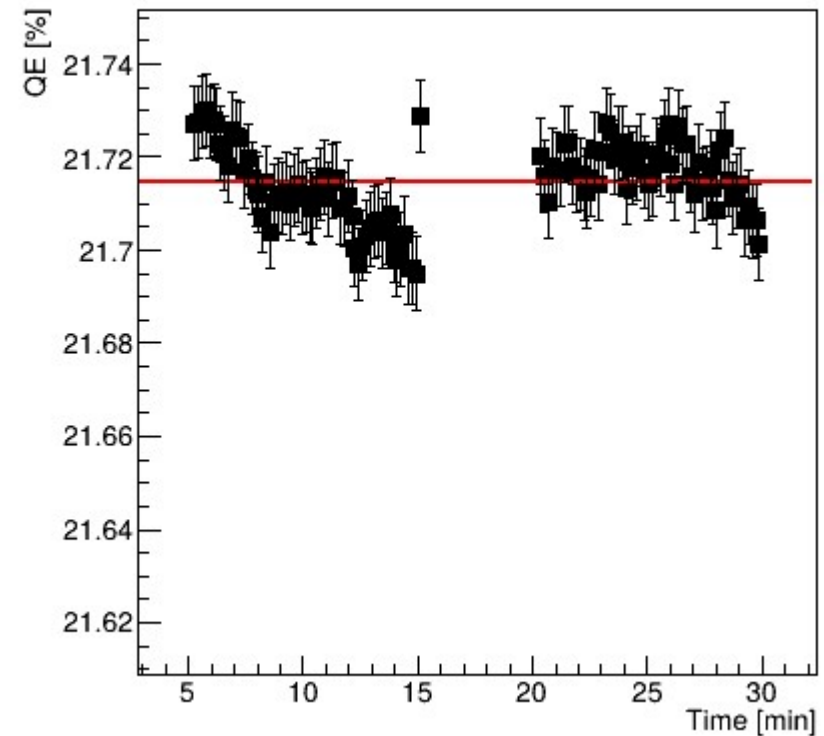


Aging region after 2.5 yrs equivalent illumination

AGE QE avg M1



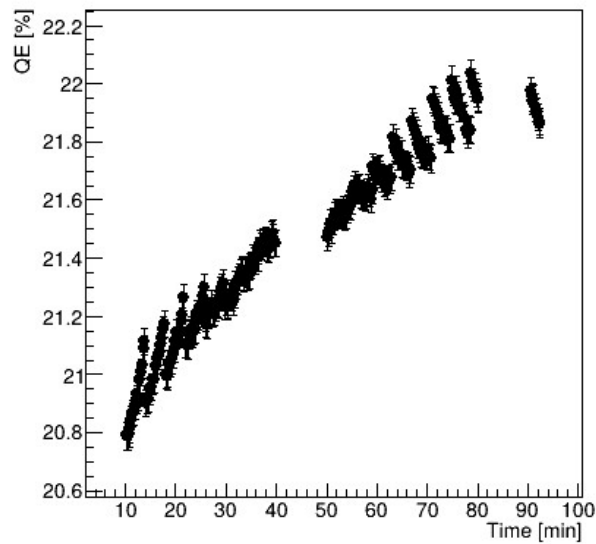
AGE QE avg BEFORE



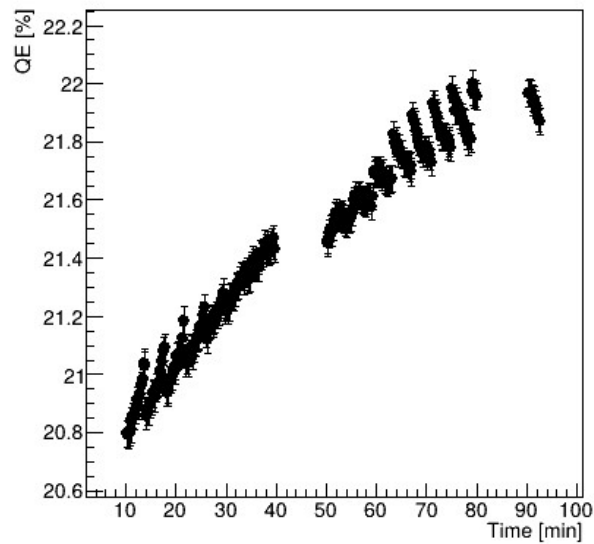
- Average QE -- Slight decrease at the limit of our resolution

Aging region after 2.5 yrs equivalent illumination

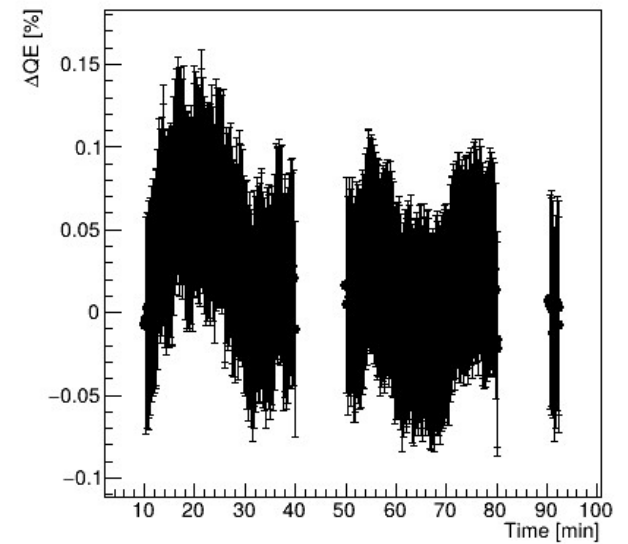
AGE QE scan M1



AGE QE scan BEFORE

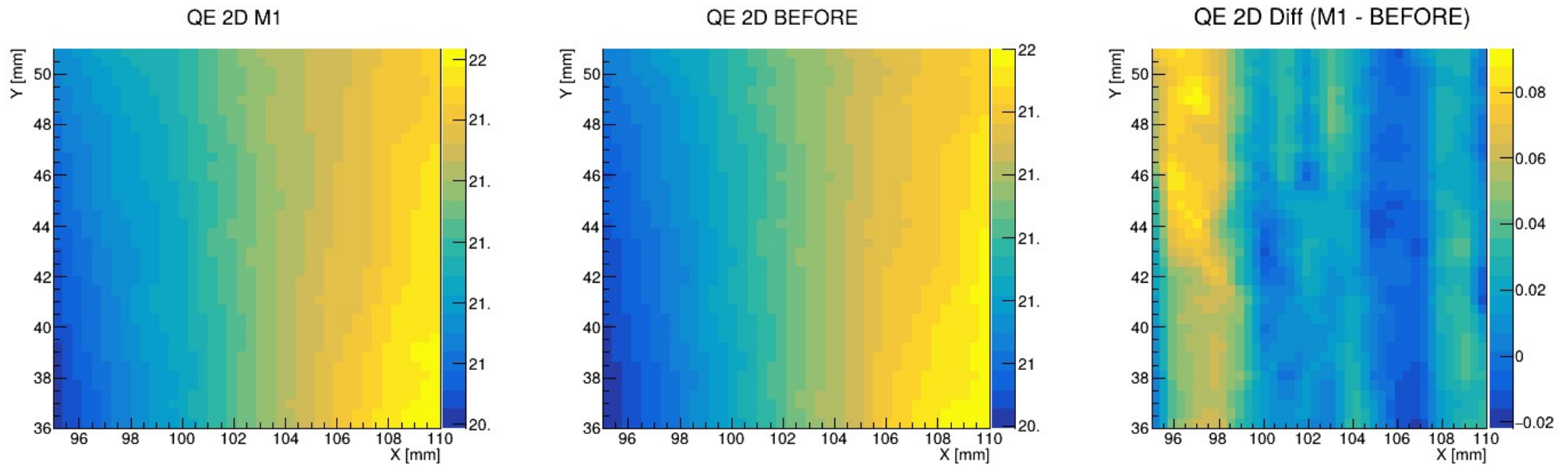


AGE QE scan Diff (M1 - BEFORE)



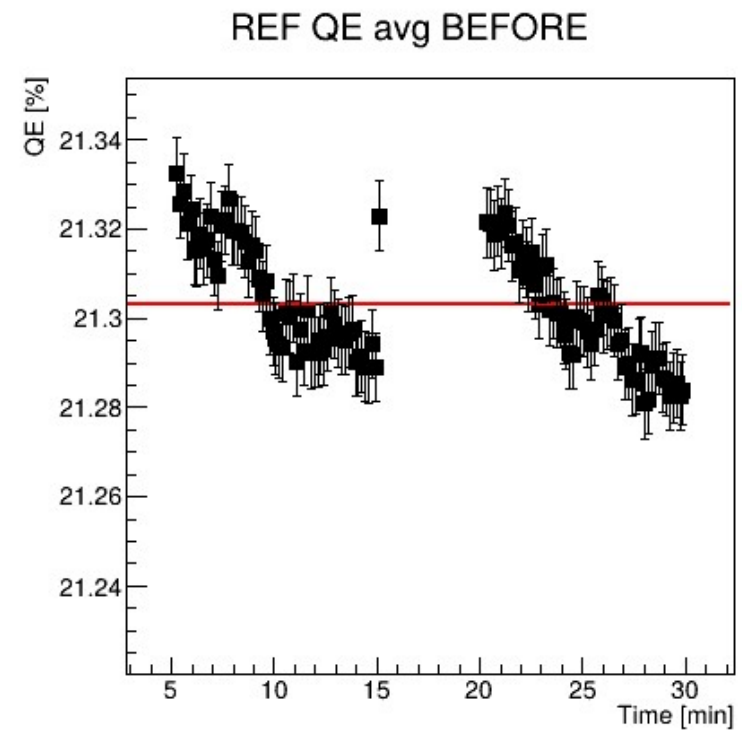
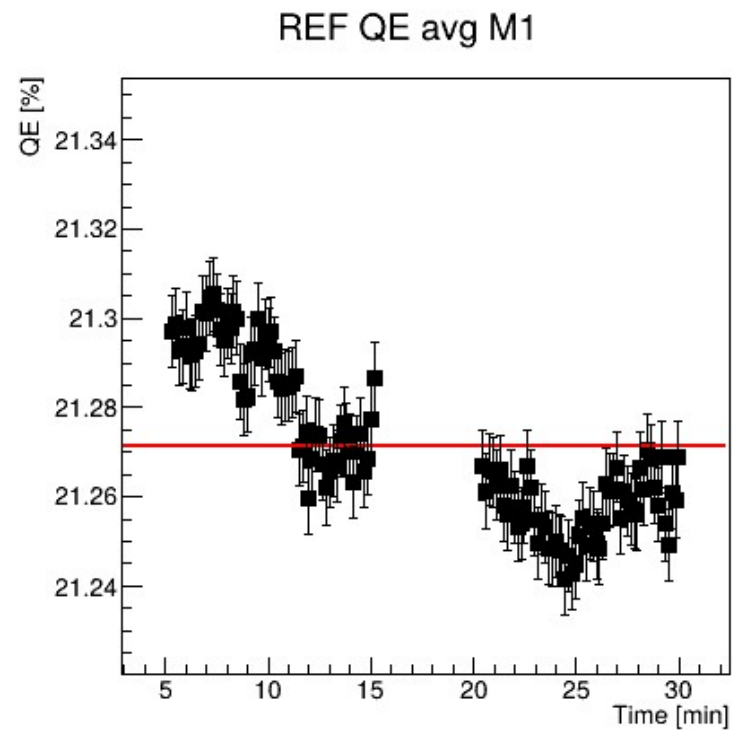
- QE Scan -- No noticeable change

Aging region after 2.5 yrs equivalent illumination



- QE Scan -- No noticeable change

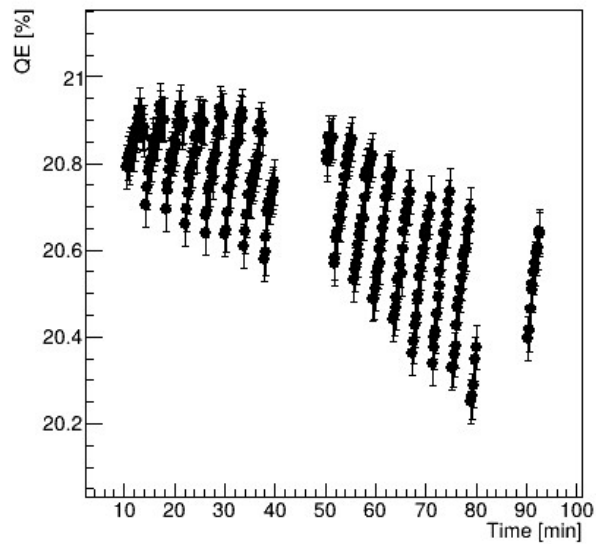
Reference region



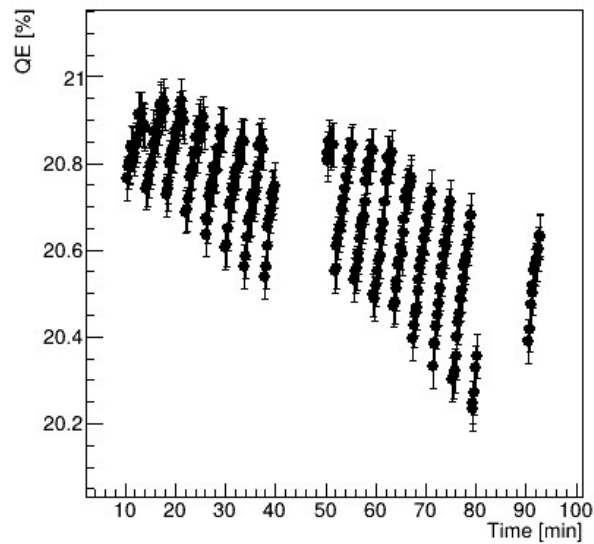
- QE Average -- No noticeable change

Reference region

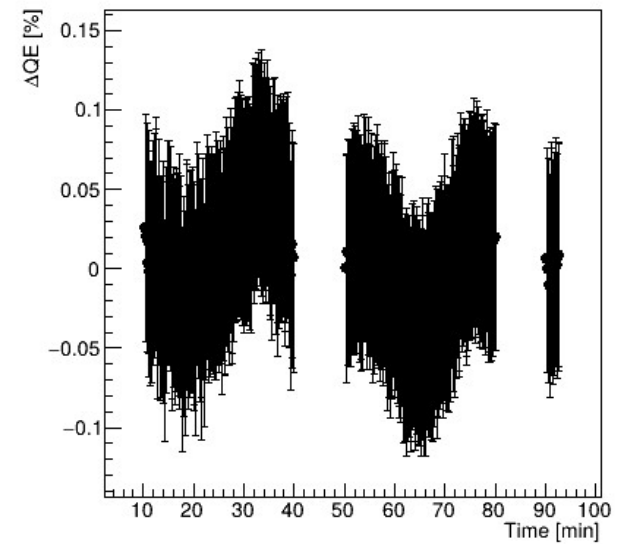
REF QE scan M1



REF QE scan BEFORE

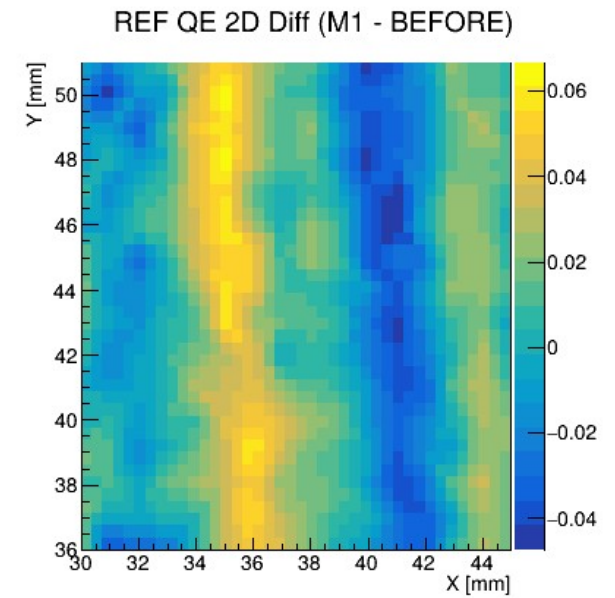
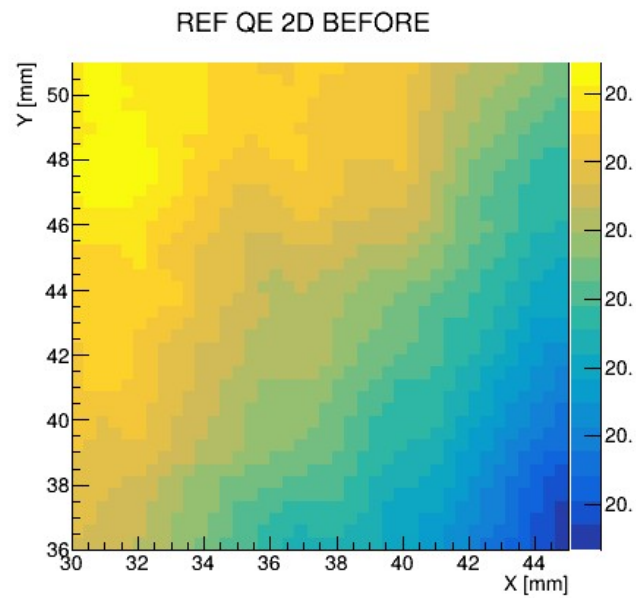
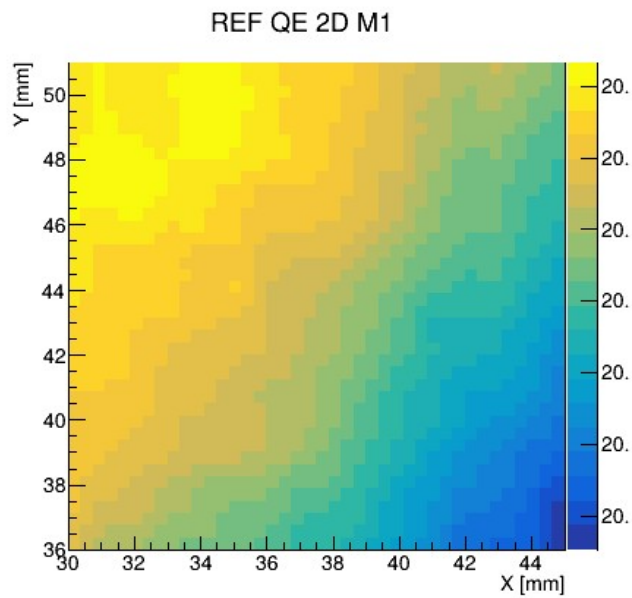


REF QE scan Diff (M1 - BEFORE)



- QE Scan -- No noticeable change

Reference region



- QE Scan -- No noticeable change