

TPA-TCT on cylindrical 3D structure IME3D A14

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Motivation

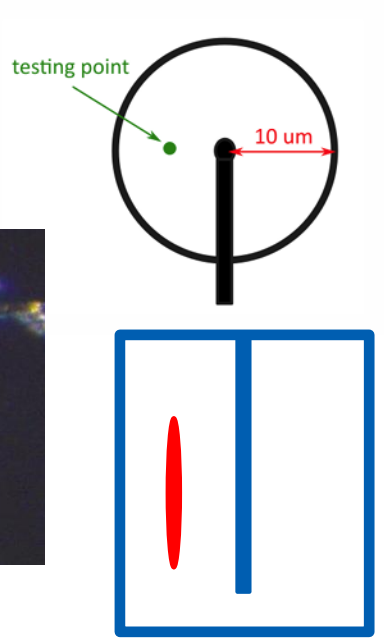
Neff is negative

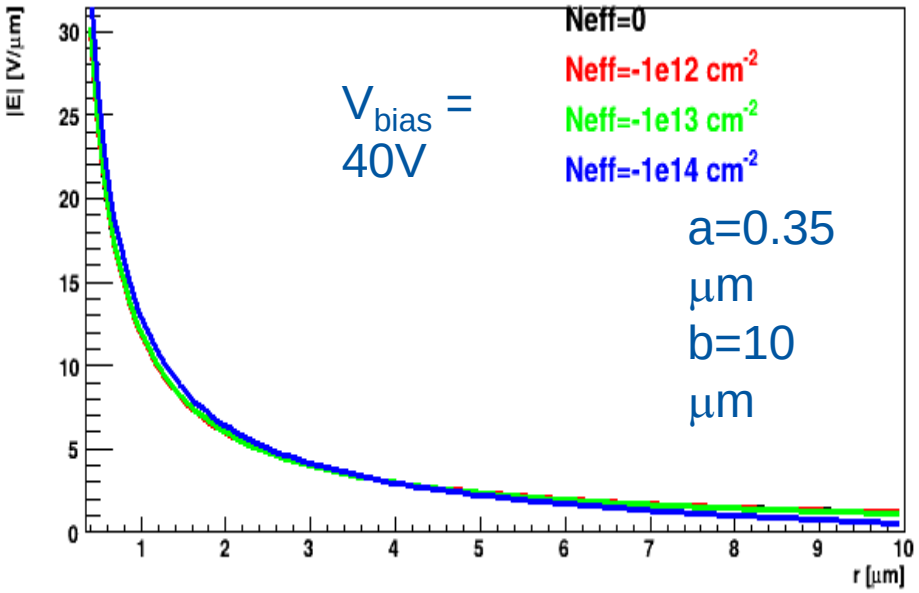
$$E_r(r) = \frac{V_0 - \frac{e_0 N_{\text{eff}}}{4\varepsilon\varepsilon_0}(b^2 - a^2)}{r \ln(b/a)} + \frac{e_0 N_{\text{eff}} r}{2\varepsilon\varepsilon_0}$$

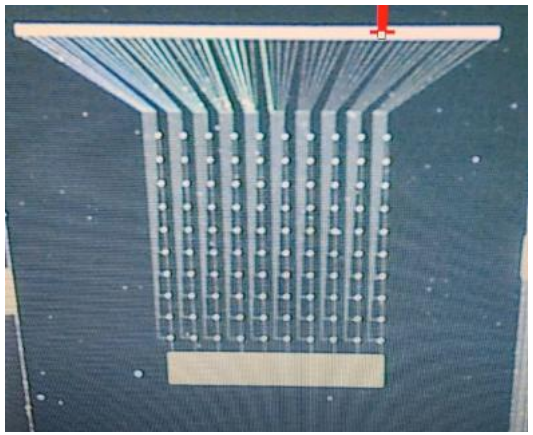
Components of the Equation

- V_0: Applied bias voltage.
- e_0: Elementary charge.
- N_{eff}: Effective space charge concentration.
- ε: Relative permittivity of the material.
- ε_0: Permittivity of free space.
- a, b: Inner and outer radii of the cylindrical system.
- r: Radial distance from the center axis ($a \leq r \leq b$).



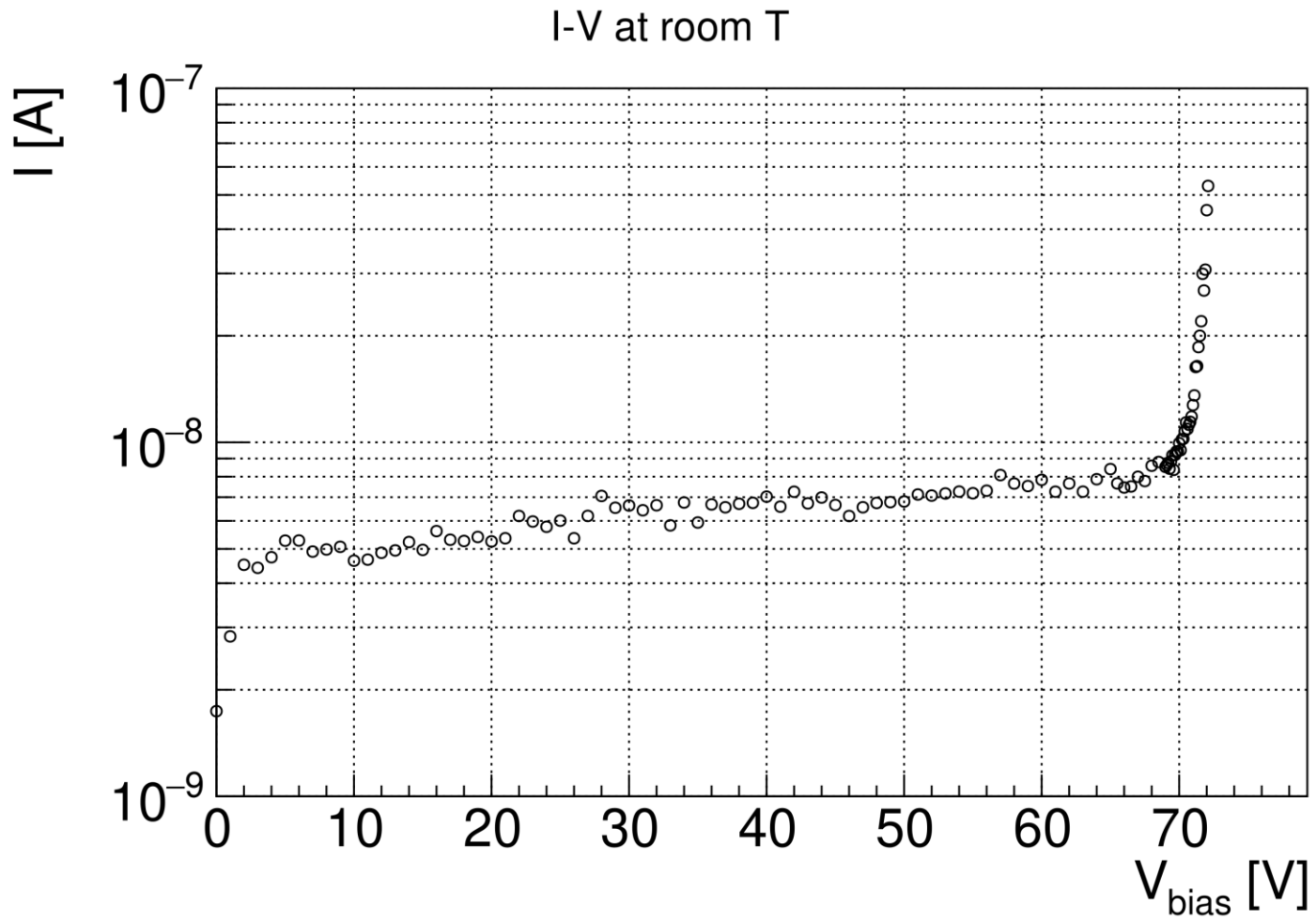




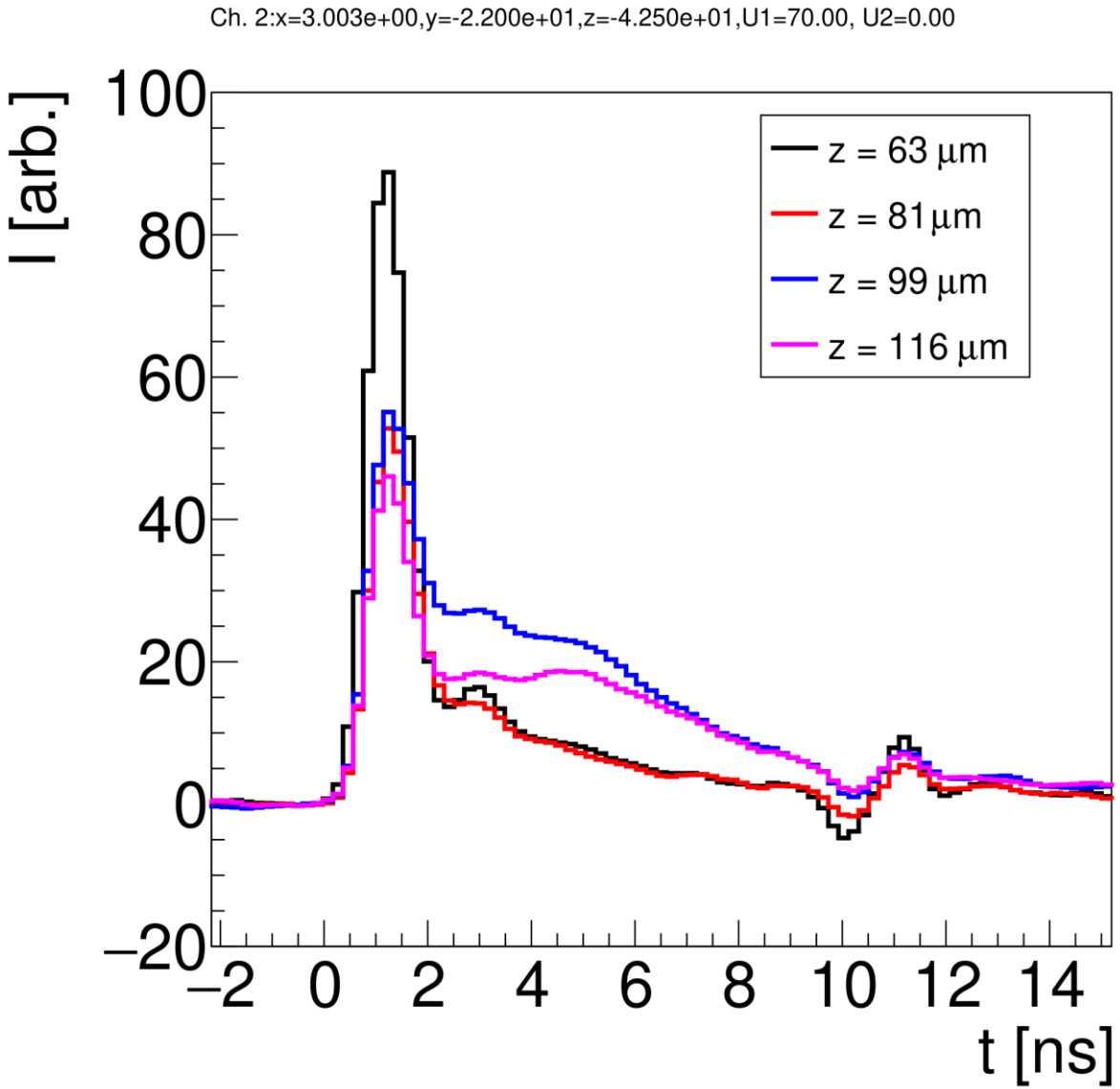


Structure A14
Diameter 20 µm, electrode diameter 1 µm
(b = 10, a ~ 0.5)

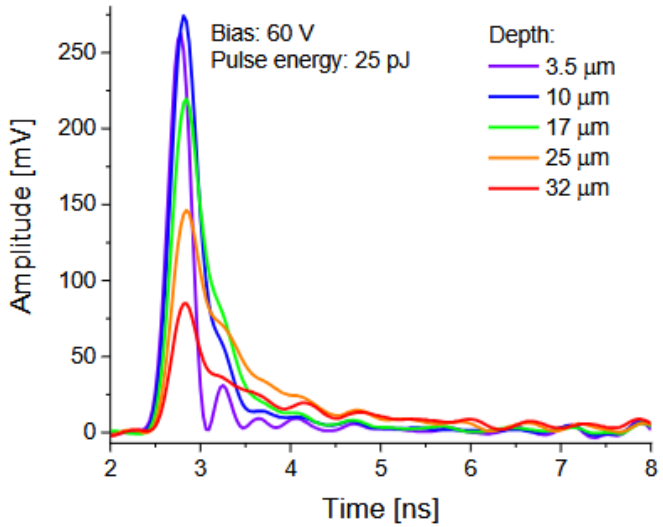
I-V



Waveforms

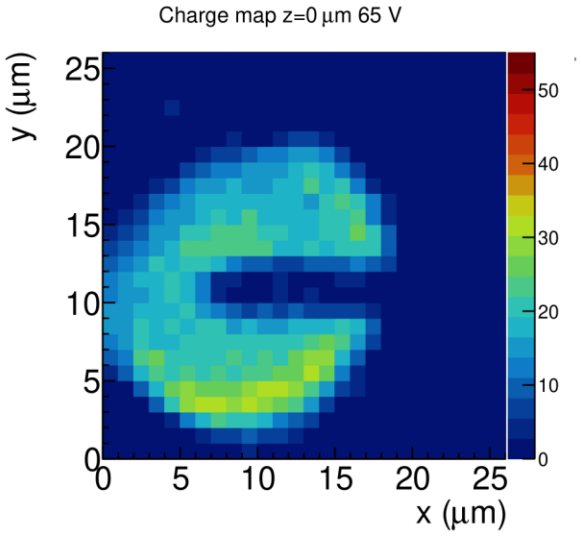


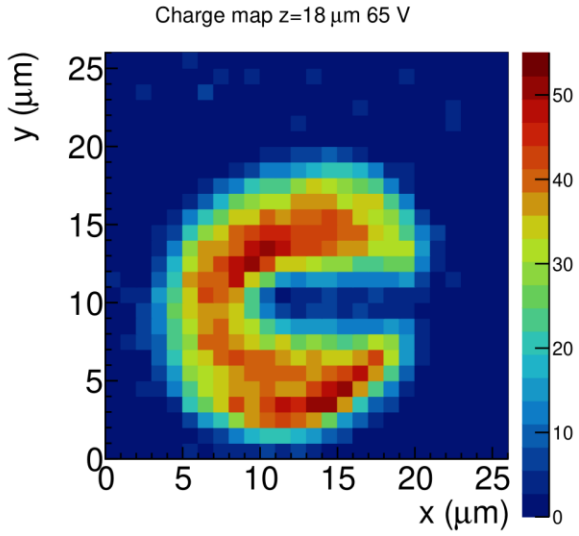
- Waveforms have an extended tail
  - Not observed at ELI
- What is charge integration time?
  - 2 ns?
  - 20 ns?
- DRS4 is bandwidth limited

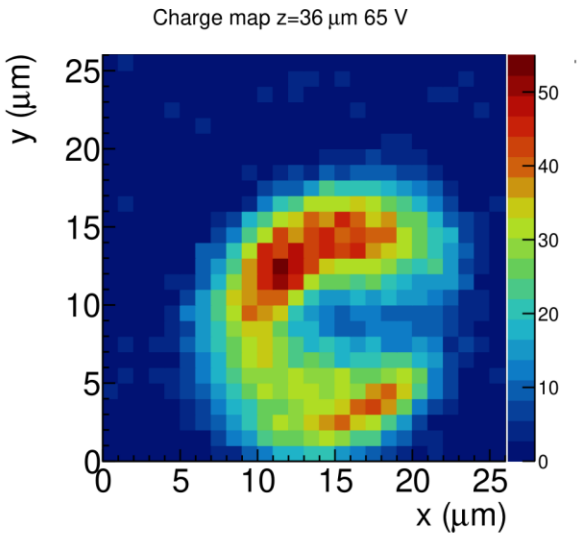


ELI (Gordana)

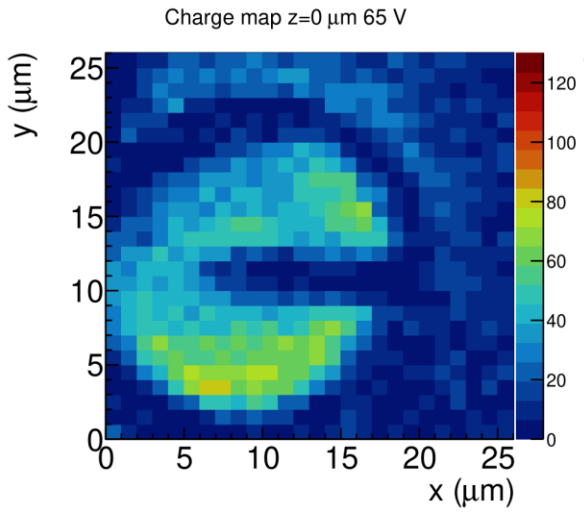
2d maps at few different z

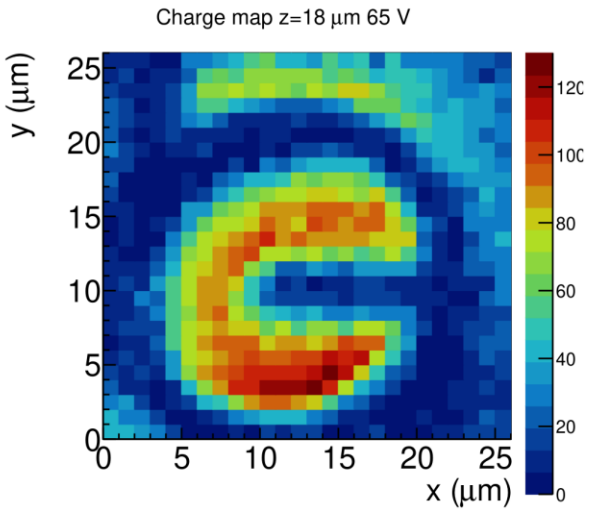


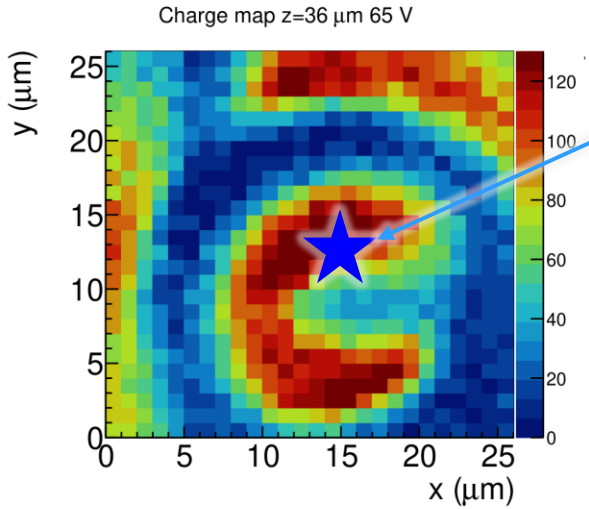




2 ns integration time



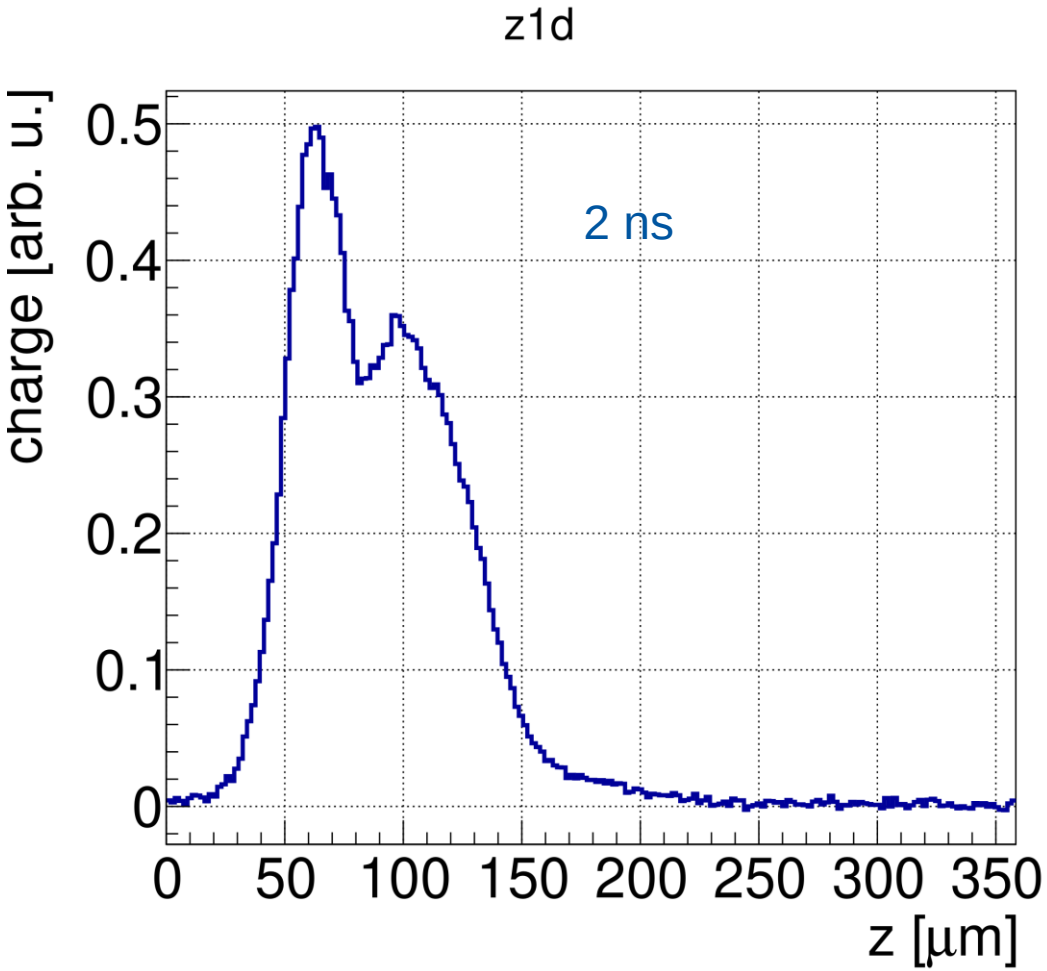


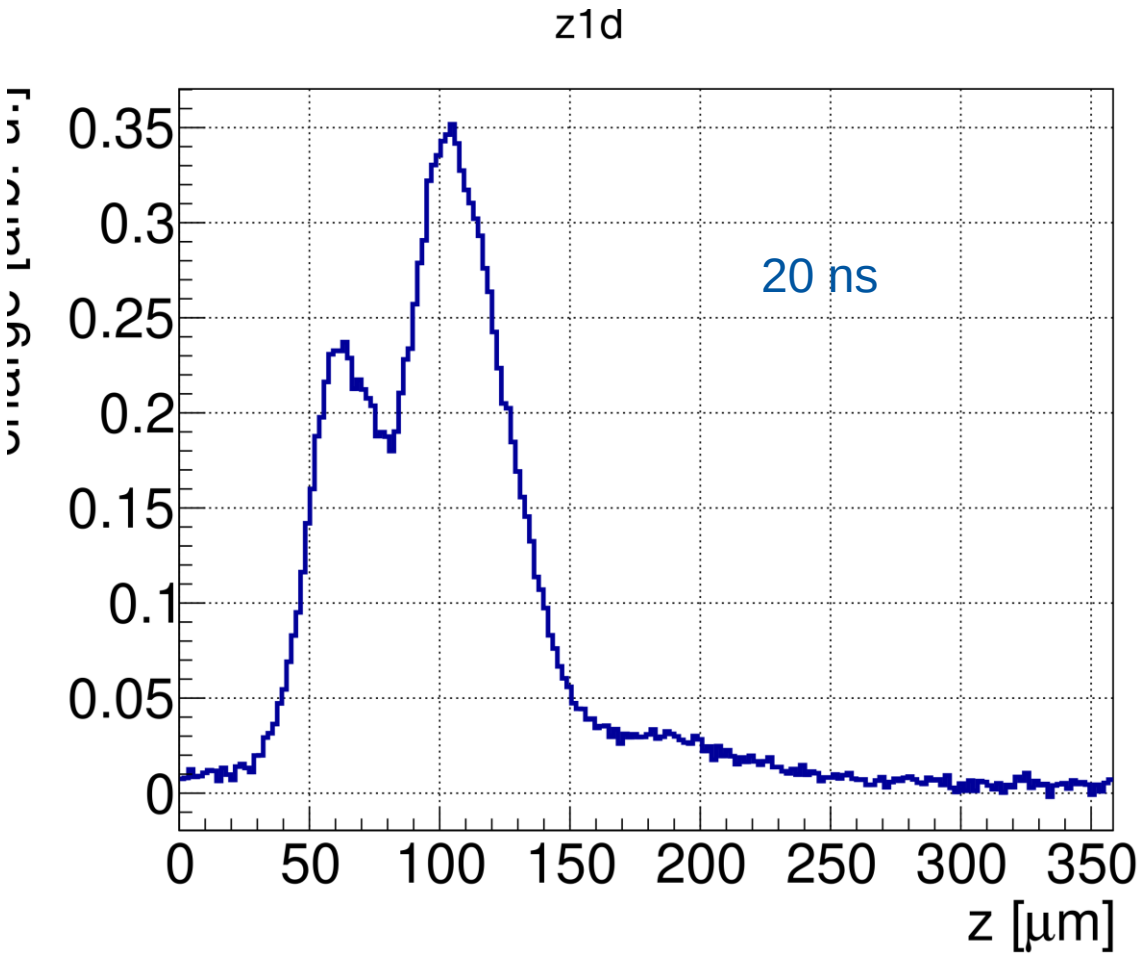


point of interest in 1-d

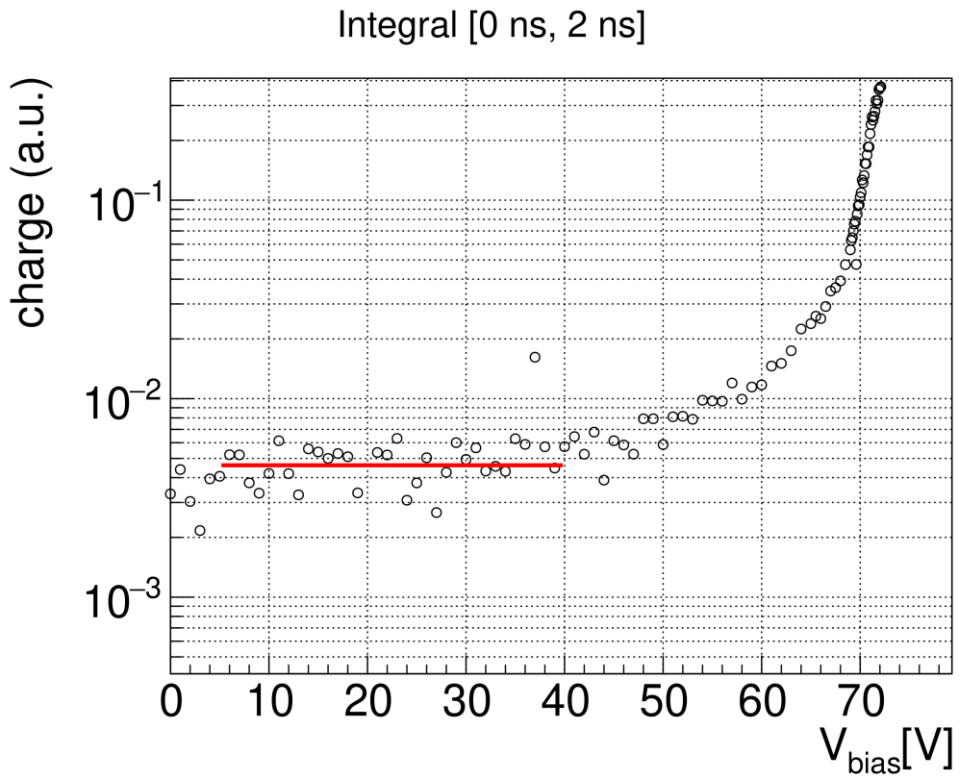
20 ns integration time

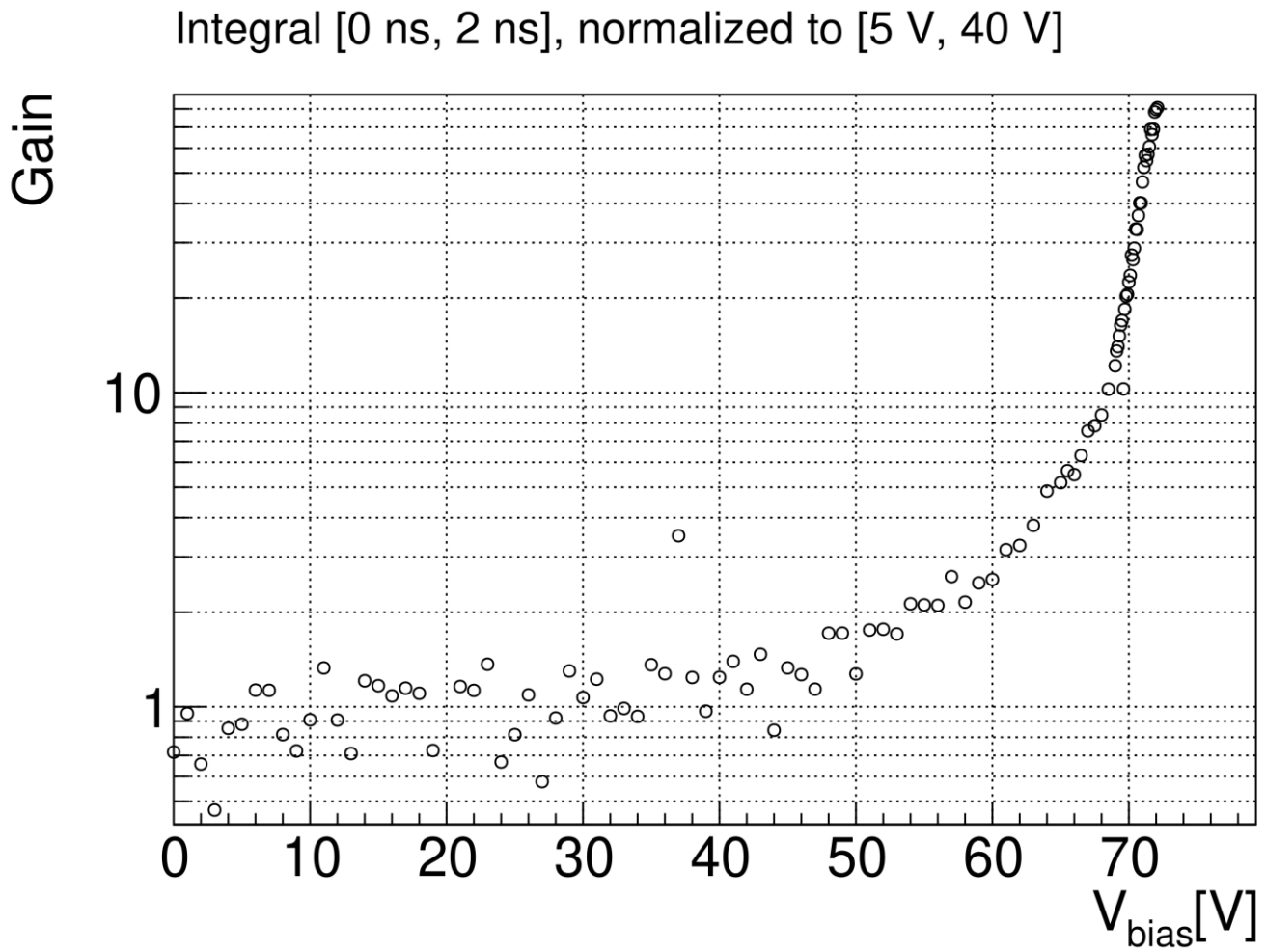
z-scan


z1d
charge [arb. u.]
0.5
0.4
0.3
0.2
0.1
0
2 ns
0
50
100
150
200
250
300
350
z [µm]


z1d
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
20 ns
0
50
100
150
200
250
300
350
z [µm]

Voltage scan (close to surface) – 2 ns





Voltage scan (close to surface) – 20 ns

