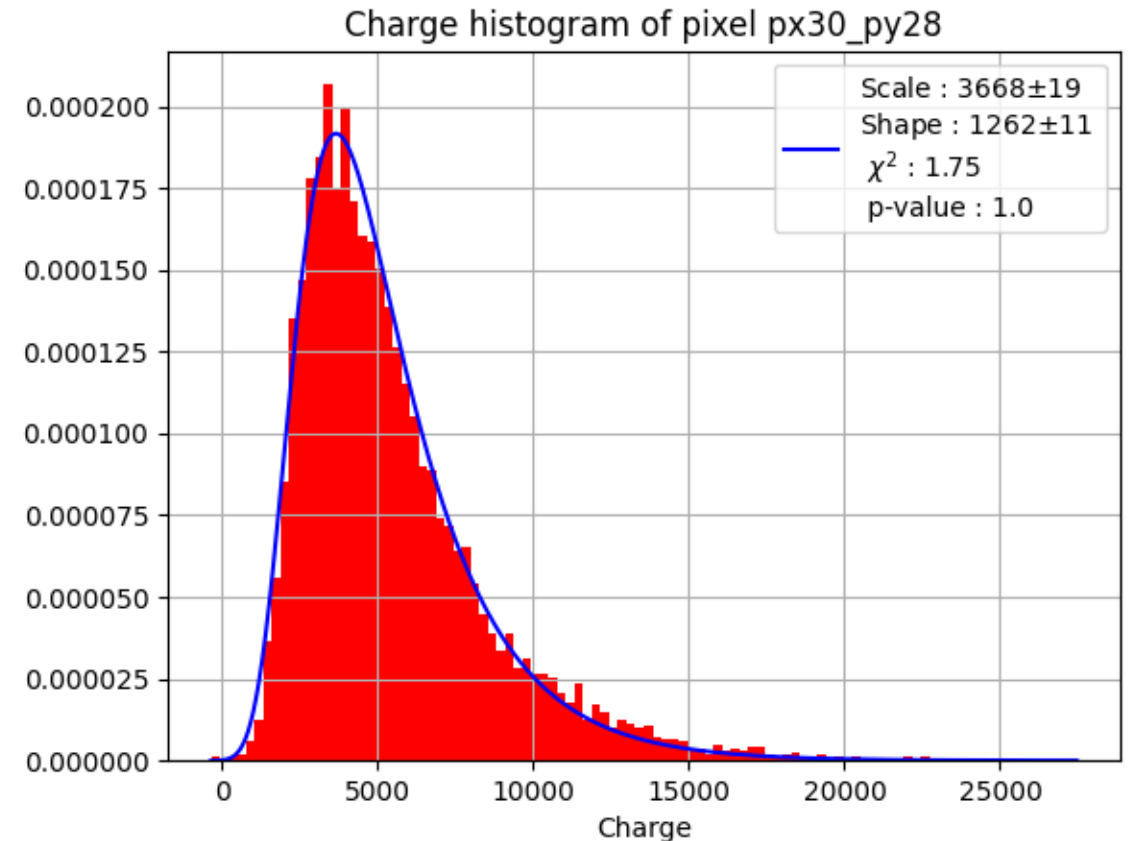


MPW4 Sr90 and calibration problems

- Sensor: **Topside biased MPW4 HV-CMOS**
- Depleted with -200V, threshold of 0.94V
- All upcoming plots are from pixel 30x28, but the same effects have been observed in other pixels

Incorrect Charge

- SR-90 Source, 10000 hits
- Minimum ionizing particle:
80 e-h pairs per micron
→ 24000 e-h pairs
- ~3000 electrons measured
from fit of Landau
distribution



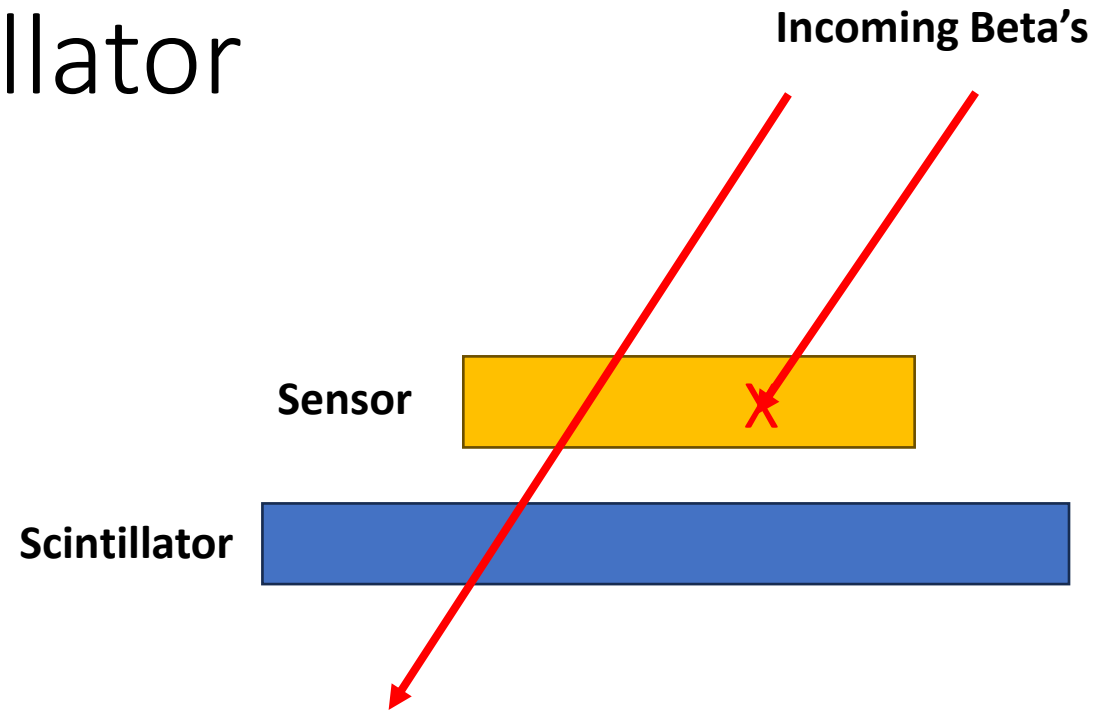
Clustering

- Both for Am241 and Sr90 sources there are no cases in the dump file where adjacent pixels have outputs in the same timeframe
- Only isolated events

```
iniWord = af319c56 SOF ovflwCnt = 3251286 Base
iniWord = af319c5a SOF ovflwCnt = 3251290 Base
iniWord = af319c5e SOF ovflwCnt = 3251294 Base
iniWord = af319c64 SOF ovflwCnt = 3251300 Base
iniWord = af319c67 SOF ovflwCnt = 3251303 Base
iniWord = 186f2d15 piggy? 0 idx = 55:48 TSTE = 045 TSLE = 021 Tot = 024
iniWord = af319c70 SOF ovflwCnt = 3251312 Base
iniWord = af319c74 SOF ovflwCnt = 3251316 Base
iniWord = af319c78 SOF ovflwCnt = 3251320 Base
iniWord = af319c7d SOF ovflwCnt = 3251325 Base
iniWord = af319c82 SOF ovflwCnt = 3251330 Base
iniWord = af319c85 SOF ovflwCnt = 3251333 Base
iniWord = af319c89 SOF ovflwCnt = 3251337 Base
iniWord = af319c8e SOF ovflwCnt = 3251342 Base
iniWord = af319c92 SOF ovflwCnt = 3251346 Base
iniWord = af319c96 SOF ovflwCnt = 3251350 Base
iniWord = af319c9b SOF ovflwCnt = 3251355 Base
iniWord = af319c9f SOF ovflwCnt = 3251359 Base
iniWord = af319ca4 SOF ovflwCnt = 3251364 Base
iniWord = 731556a piggy? 0 idx = 24:15 TSTE = 085 TSLE = 106 Tot = 235
iniWord = af319cac SOF ovflwCnt = 3251372 Base
```

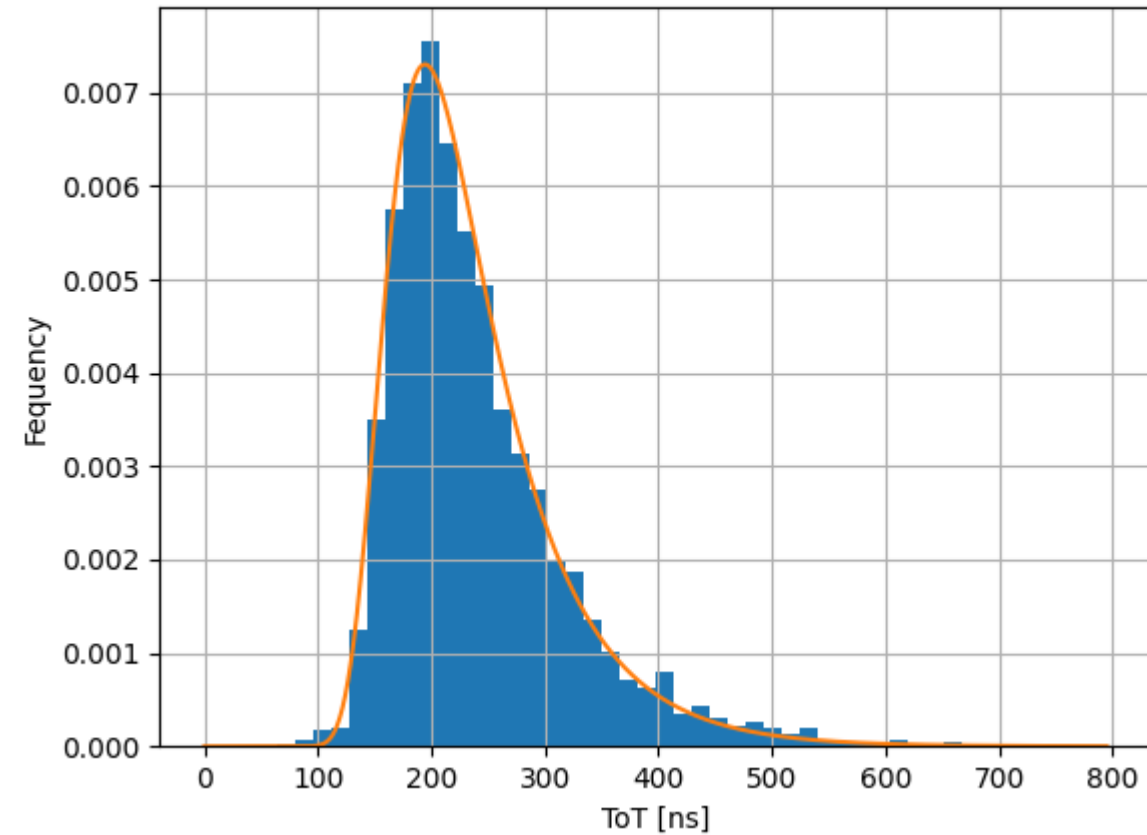
Comparison with Scintillator

- Scintillator underneath the Sensor, to make sure all particles are MIP

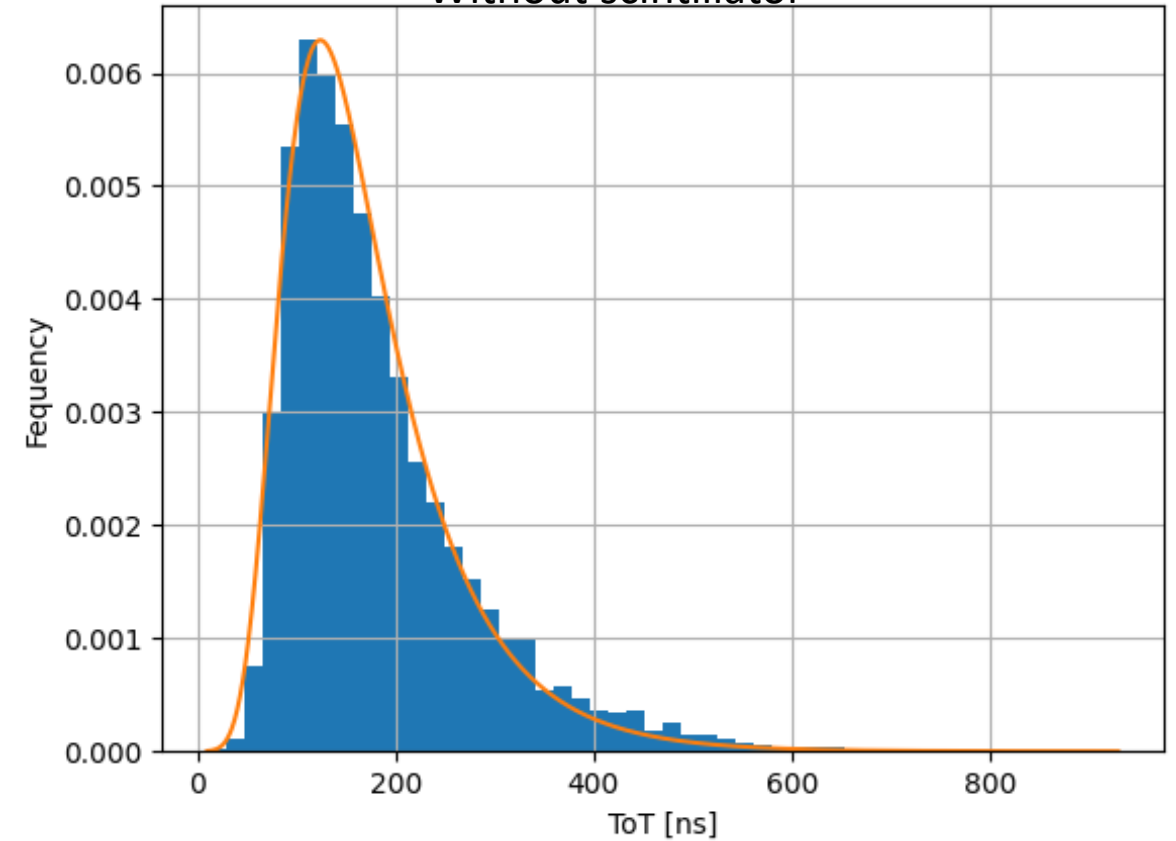


Comparison with Scintillator

With scintillator

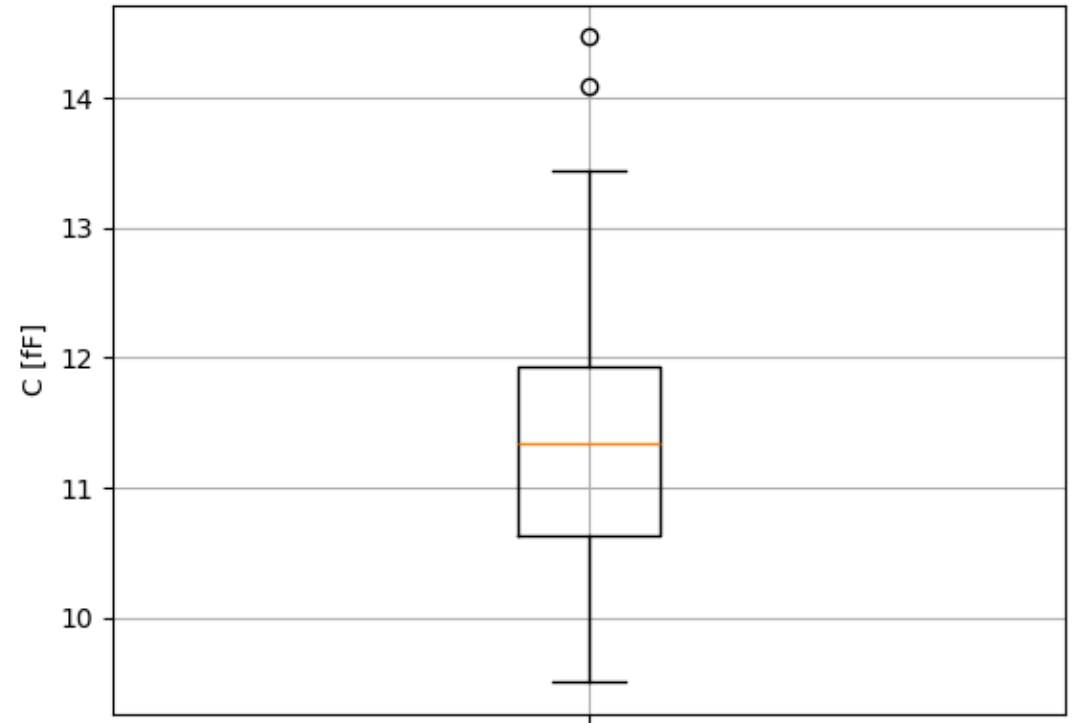


Without scintillator



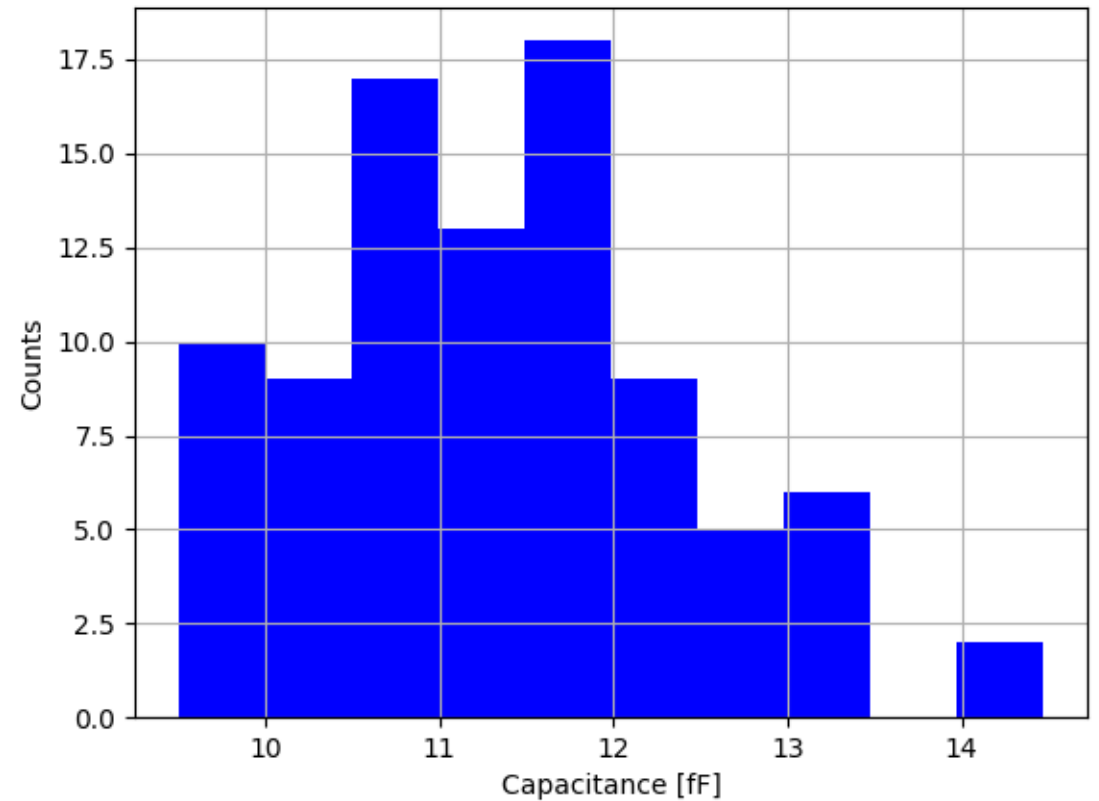
Comparison with Scintillator

- Assuming MIP = 22.000 e-
- Get mpv from Landau distr. For multiple pixels (89)
- $C = Q/V = 11.4 \pm 1.1$ fF



Comparison with Scintillator

- Assuming MIP = 22.000 e-
- Get mpv from Landau distr. For multiple pixels (89)
- $C = Q/V = 11.4 \pm 1.1$ fF

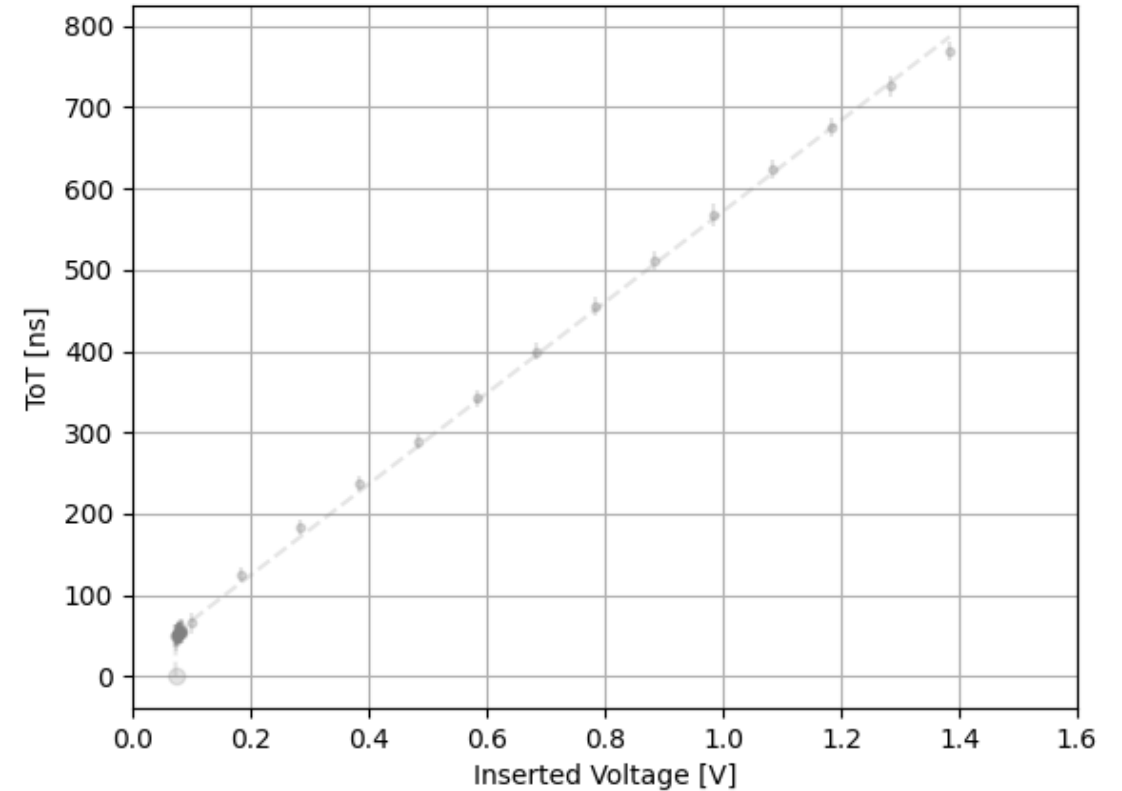


Calibration

Insert voltage, measure ToT

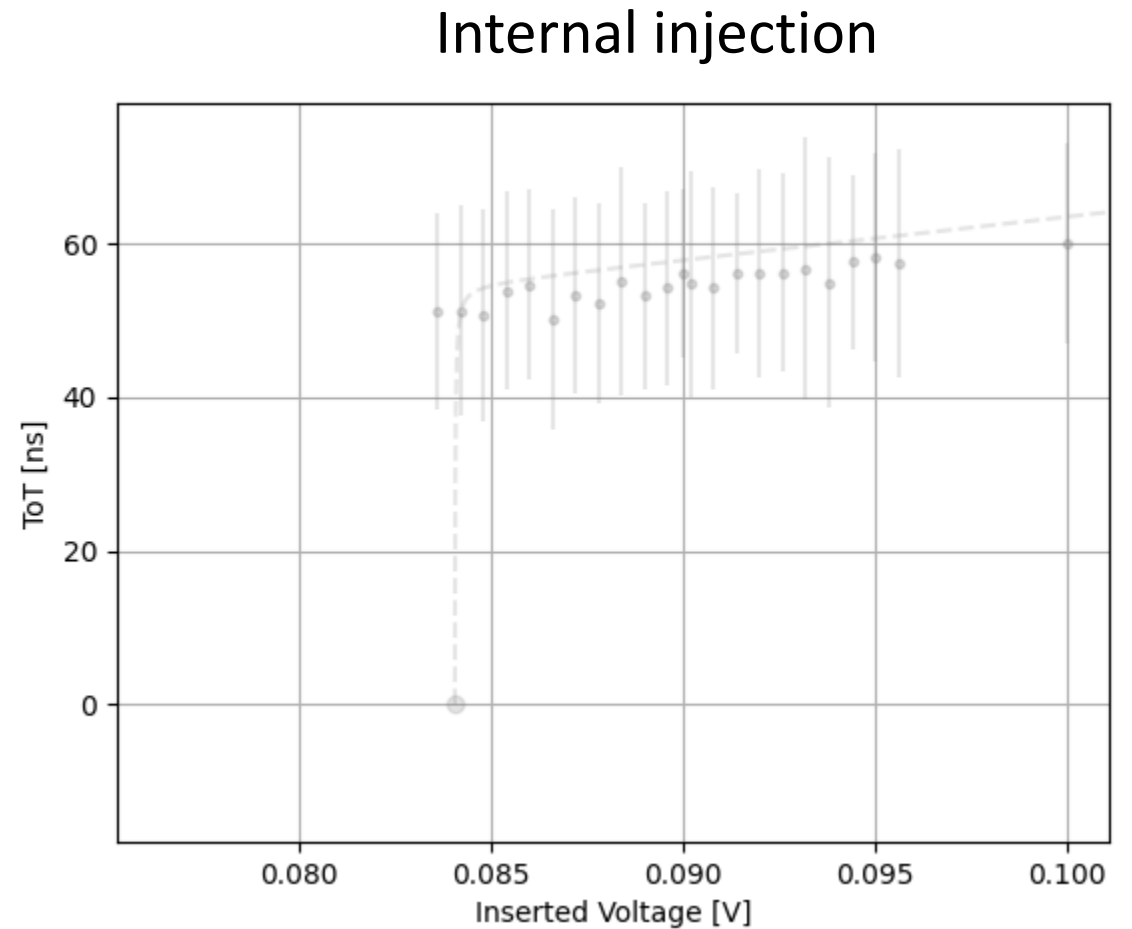
Fit given by:

$$f(x, p_0, p_1, p_2, p_3) = p_0 + p_1x - \frac{p_2}{p_3 - x}$$



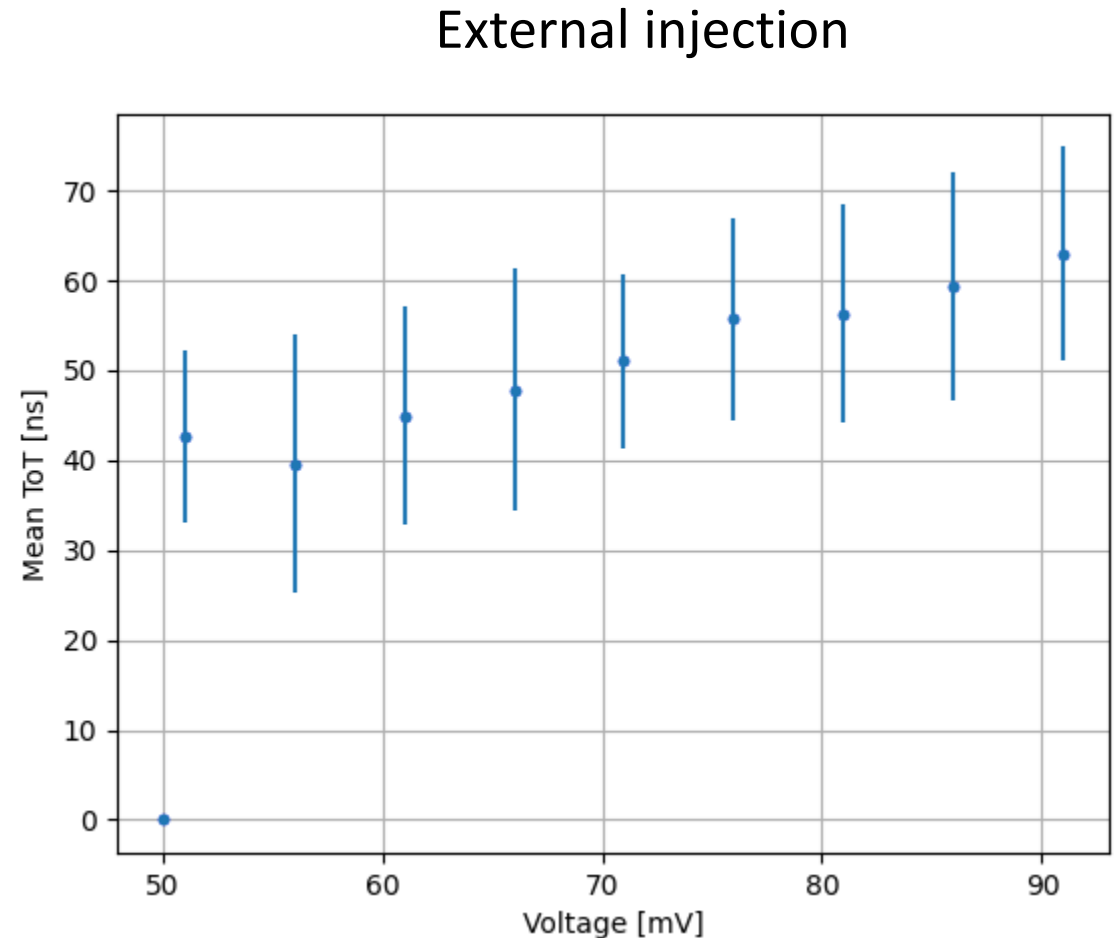
Abrupt rise ToT for calibration

- Insert voltage, measure ToT
- Low voltages (near threshold)
- Small stepsizes
- Abrupt rise in measured ToT



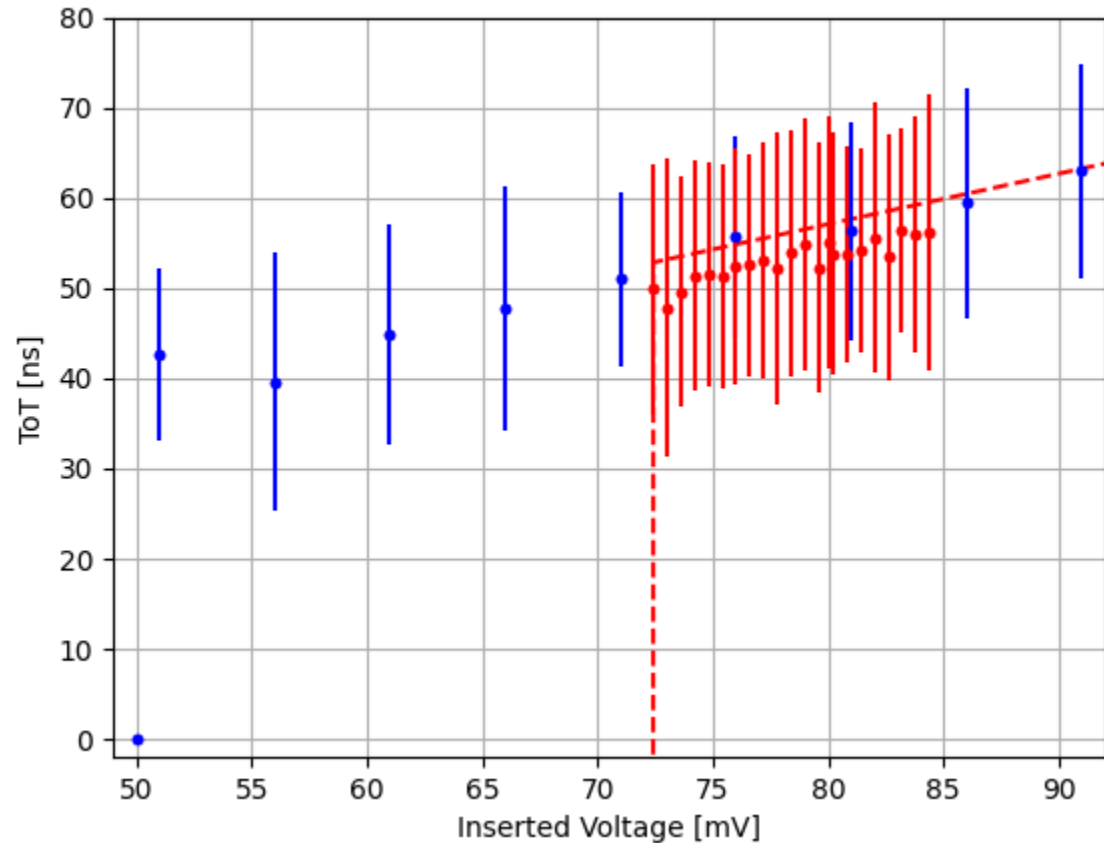
Abrupt rise ToT for calibration

- Insert voltage, measure ToT
- Low voltages (near threshold)
- Small stepsizes
- Abrupt rise in measured ToT



Abrupt rise ToT for calibration

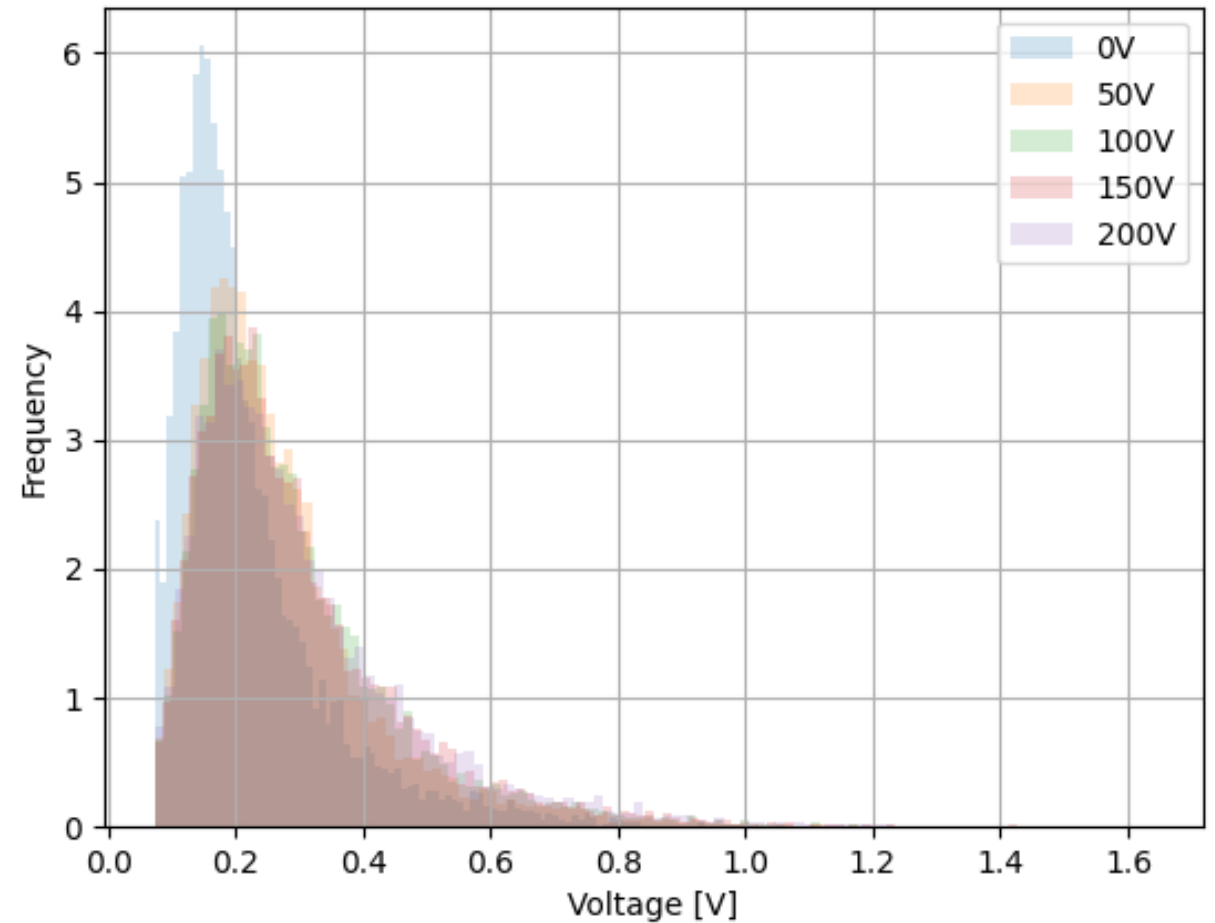
- Insert voltage, measure ToT
- Low voltages (near threshold)
- Small stepsizes
- Abrupt rise in measured ToT



Depletion voltage

- Sr-90 source
- Changed the depletion voltage
- Frequency of hits against calibrated injection voltage

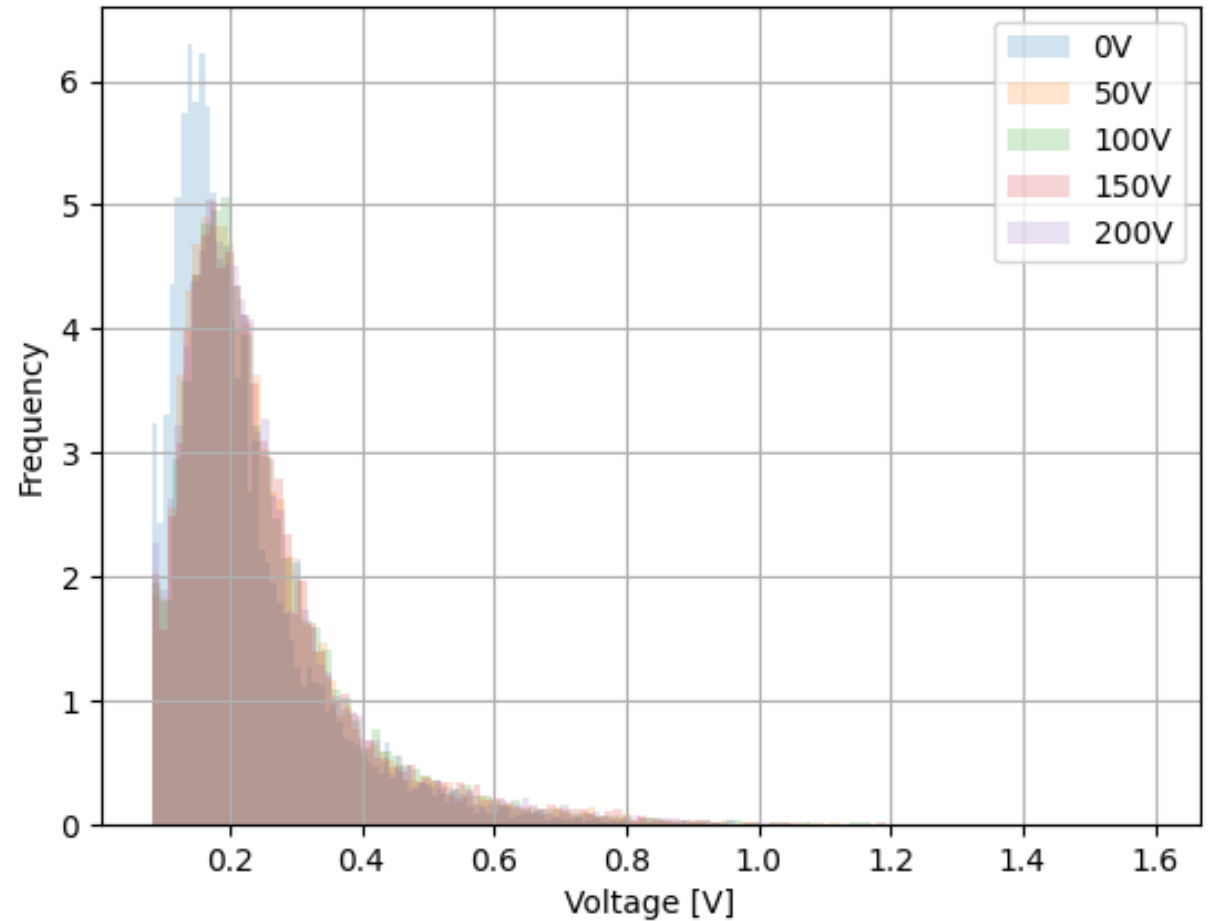
Board 1



Depletion voltage

- Sr-90 source
- Changed the depletion voltage
- Frequency of hits against calibrated injection voltage

Board 2



Depletion voltage

- Sr-90 source
- Changed the depletion voltage
- Frequency of hits against calibrated injection voltage

Scintillator

