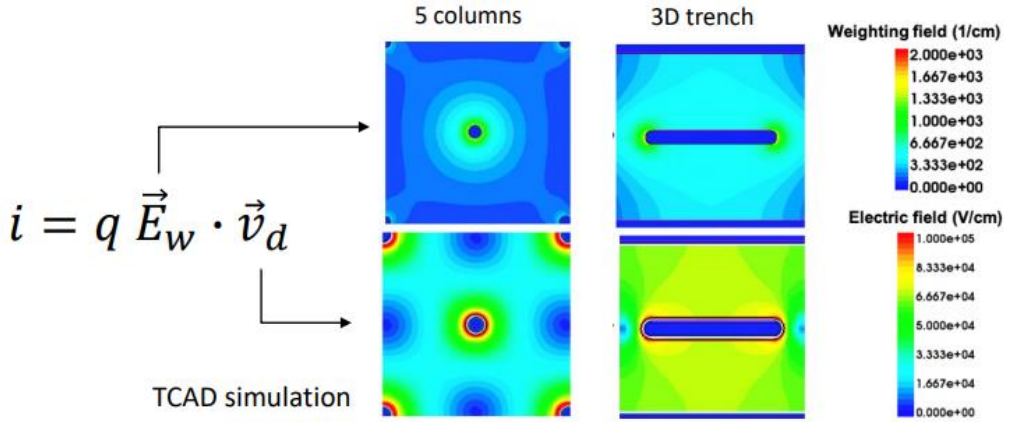
Some points for discussion

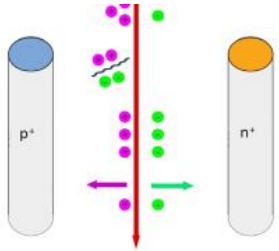
- Dario gave a talk at Trento and we see that excellent time resolution of ~35 ps is maintained also at 5e15 cm^{-2}
- I would suggest to move to 1e16 cm^{-2} next and after that 2e16 cm^{-2} followed by 0.6-1e17 cm^{-2} .
- The trench sensors TimeSPOT were presented:

$$i = q\,\vec{E}_w \cdot \vec{v}_d$$

E_w = *weighting field*, v_d = *carrier's drift velocity*

We want a detector in which the signals are position independent → $\vec{E}_w \cdot \vec{v}_d$ has to be as uniform as possible

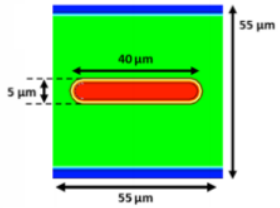




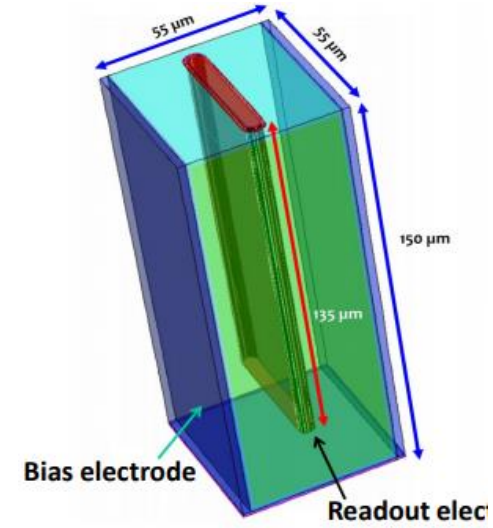
Weighting field and electric field maps **much more uniform** in the **trench geometry**

↓

This implies a fast and more uniform charge collection time

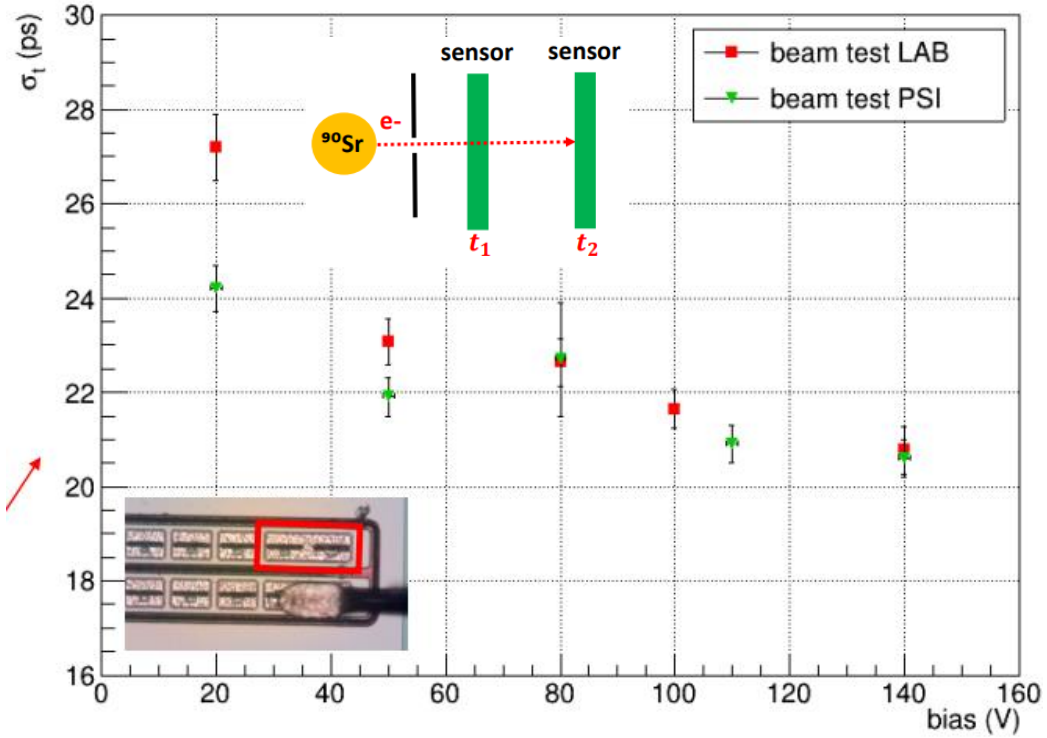


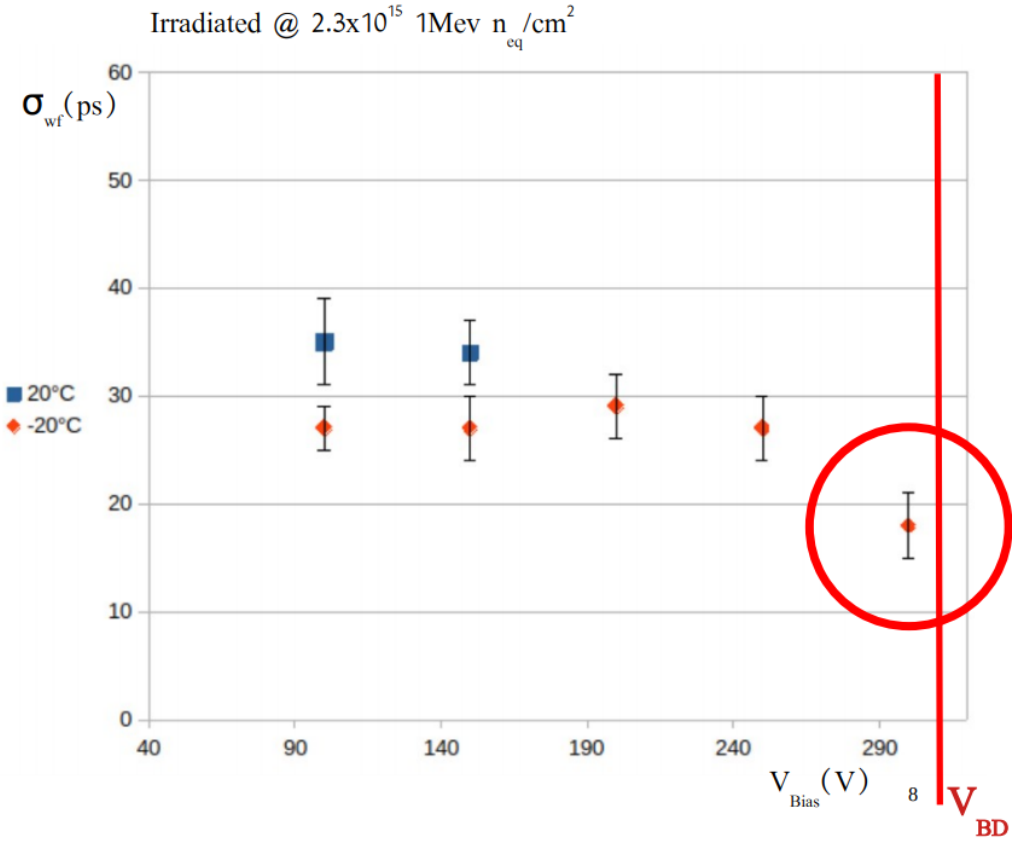
- **55x55 µm²** pixels
- **150 µm** active thickness
- Collection electrode **135 µm** deep



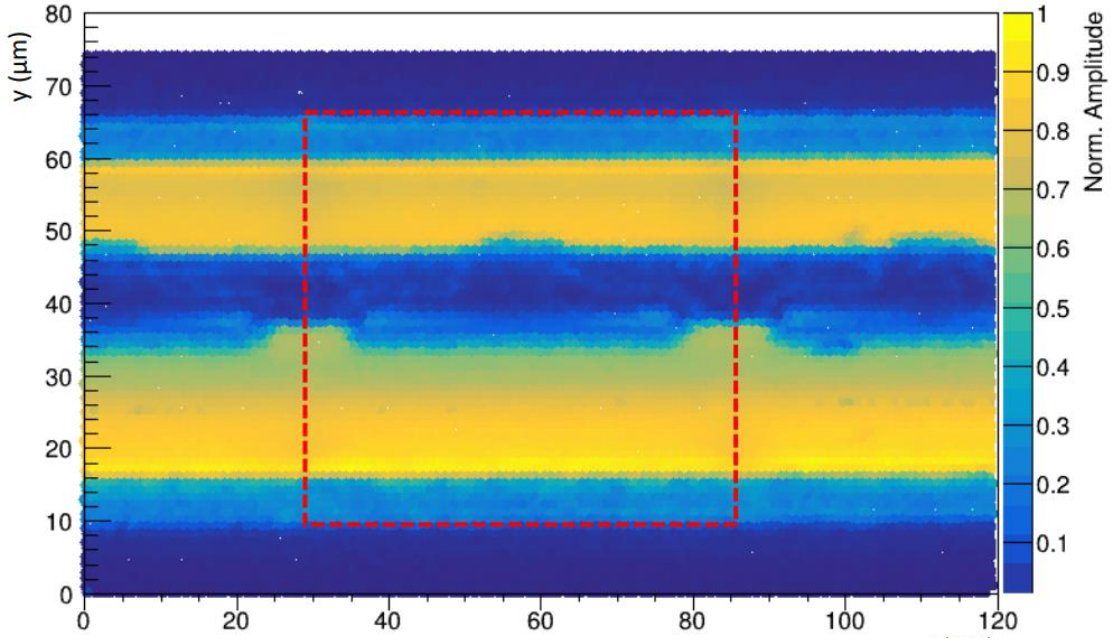
Comparison TimeSpot-Regular 3D

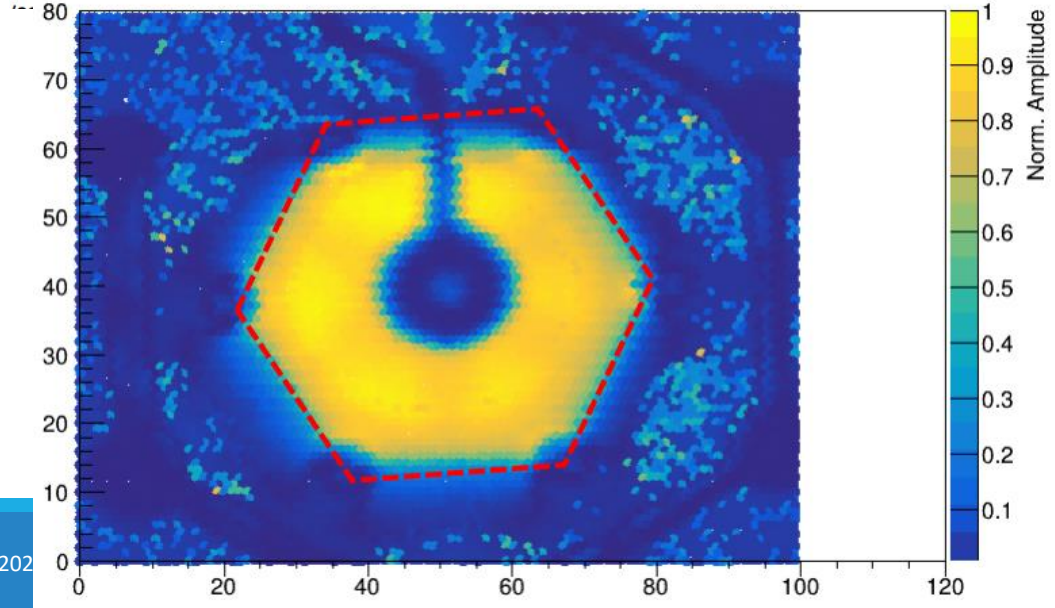
- The difference is not large – even comparable -> this is very good but we need to understand it.
- The fill factor for TimeSPOT is worse and the sensors was thinner – so detection efficiency should be worse.
- The sensor will have higher capacitance – more noise !

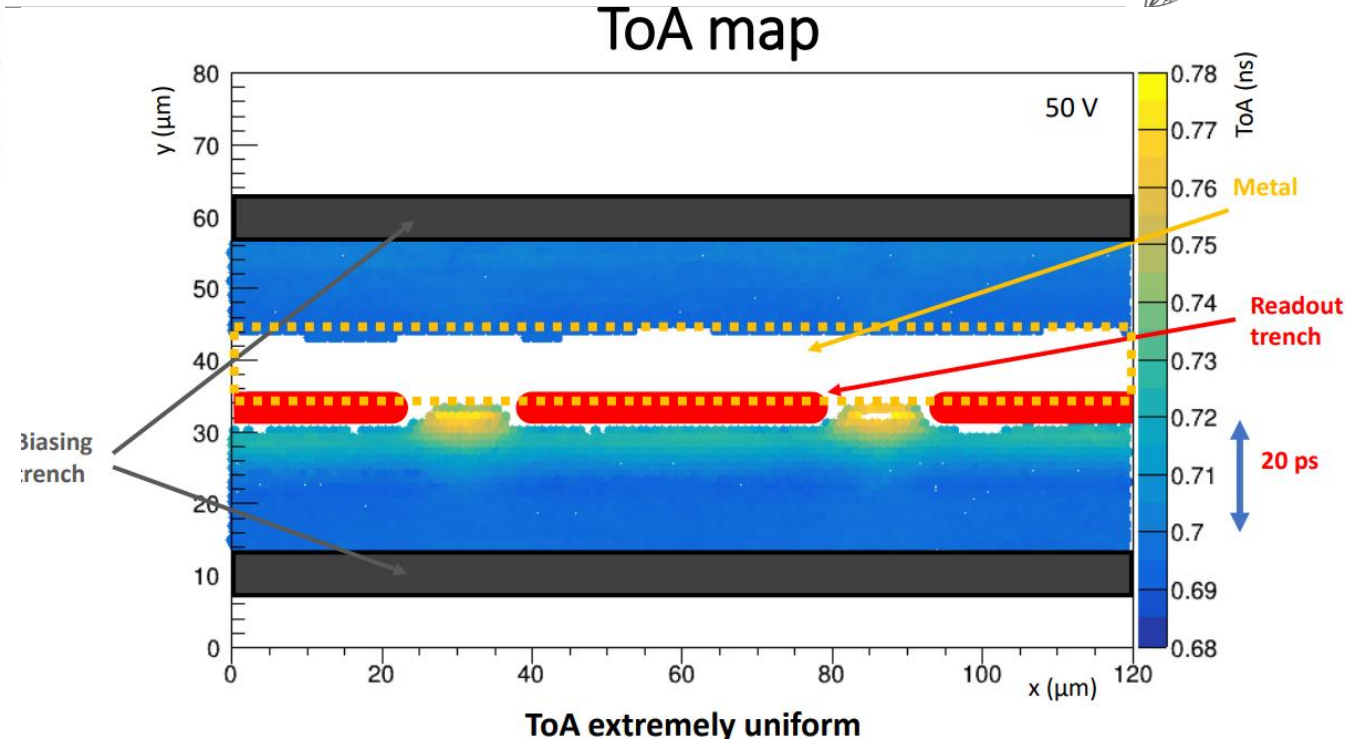




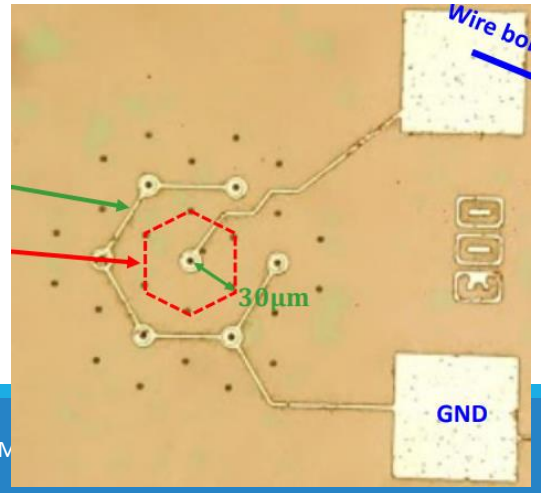
Scanning with TCT (fast laser pulse)



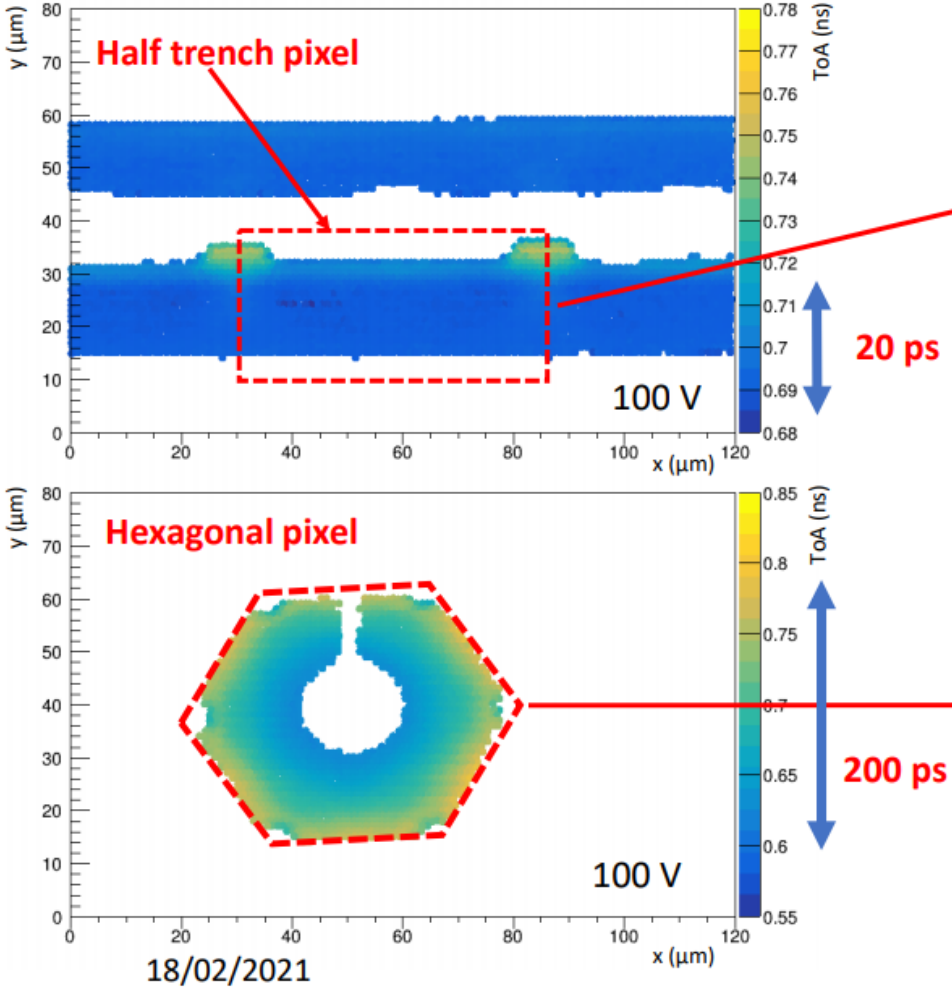


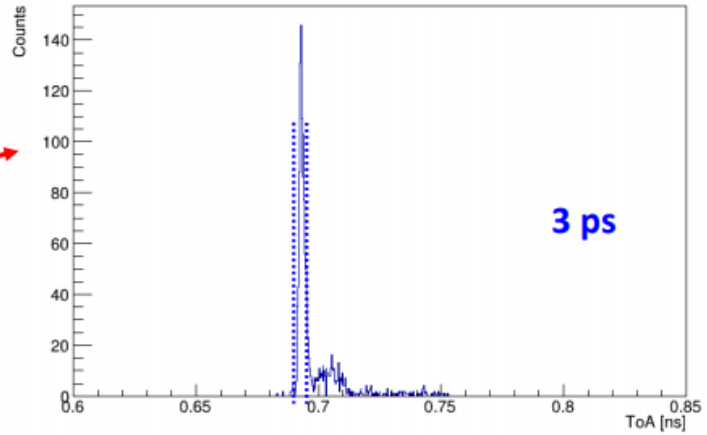


ToA extremely uniform

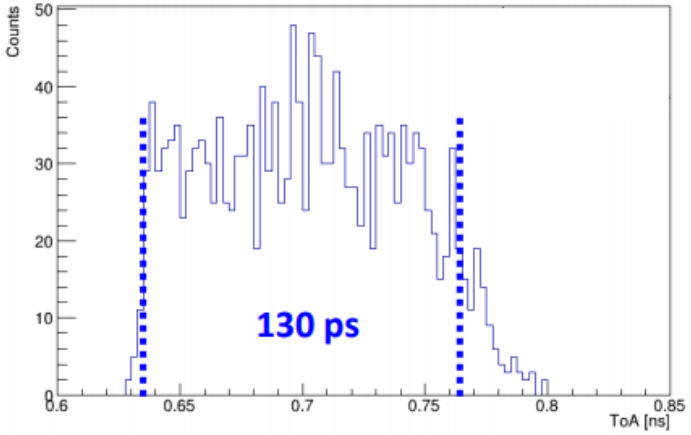


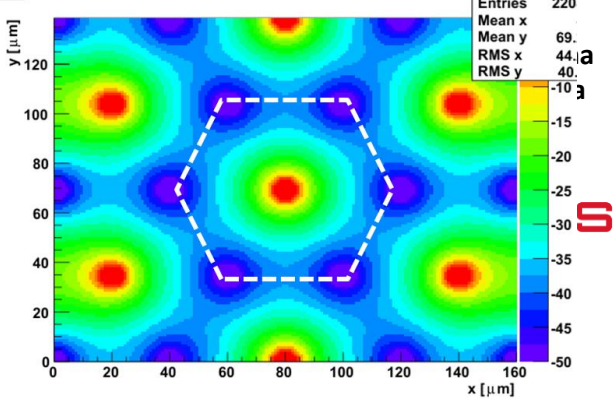
Comparison

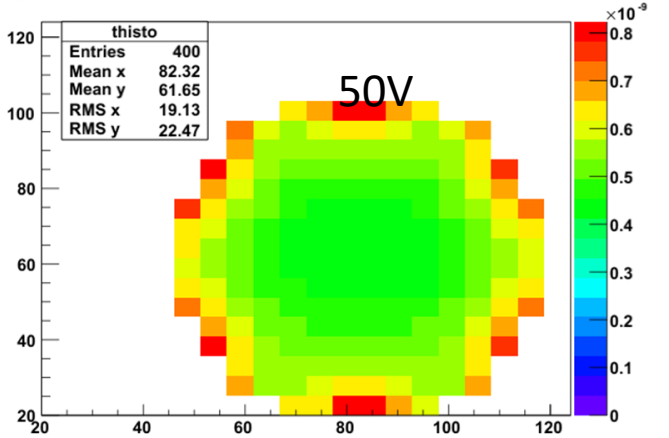


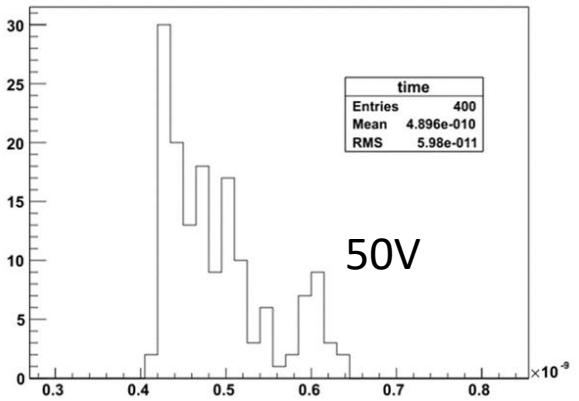


For good timing, it's not important to be fast but to be u









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Questions and comments

- Why are TimeSPOT and standard 3D of comparable cell sizes close together in timing performance?
  - Is it jitter dominated, while we are time walk dominated?
- The fill factor for perpendicular tracks is ~25% for TimeSpot and it is thinner 150 um -> so should be less efficient than standard 3D.
- The measurement of 3D sensor (Cantania) is similar to KDetSim (good verification!)