



TOT to Charge conversion files:

October 2009 H8/BAT & H6/Eudet data

## Sensori 3D FBK - 3D Software Meeting

Andrea Micelli  
(Università degli Studi di Udine)



# tbmon analysis



Name	Irrad.	C <sub>LOW</sub>	Tbmon	cal_file	TB
Planar <sup>1</sup>	-	8.117	162-13 <sup>6</sup>	0	May, Oct, June
STA-3E	-	7.92	163 <sup>4</sup> -164 <sup>5</sup> -11 <sup>6</sup>	1	May, Oct
FBK-3E9M	-	8.065	165-10 <sup>6</sup>	2	Oct
Planar	-	7	10	0 <sup>3</sup>	June 2010
FBK-3E (Bonn)	1 10e15n <sub>eq</sub> /cm <sup>2</sup>	7.92	11	1	June 2010
FBK-3E	1 10e15	8.065	12	2	June 2010
FBK-4E <sup>2</sup>	3 10e15	7.913	13	3	June 2010

Everything @ HV = -80V

<sup>1</sup> same sensor (calibration) for May, Oct (2009) and June (2010) test beam

<sup>2</sup> data are not looking good: runs 10090-10099

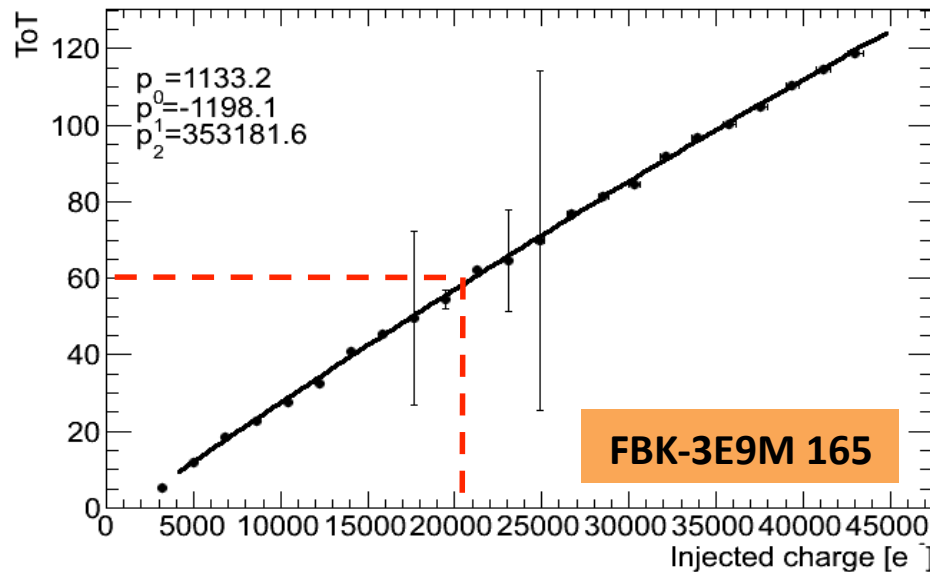
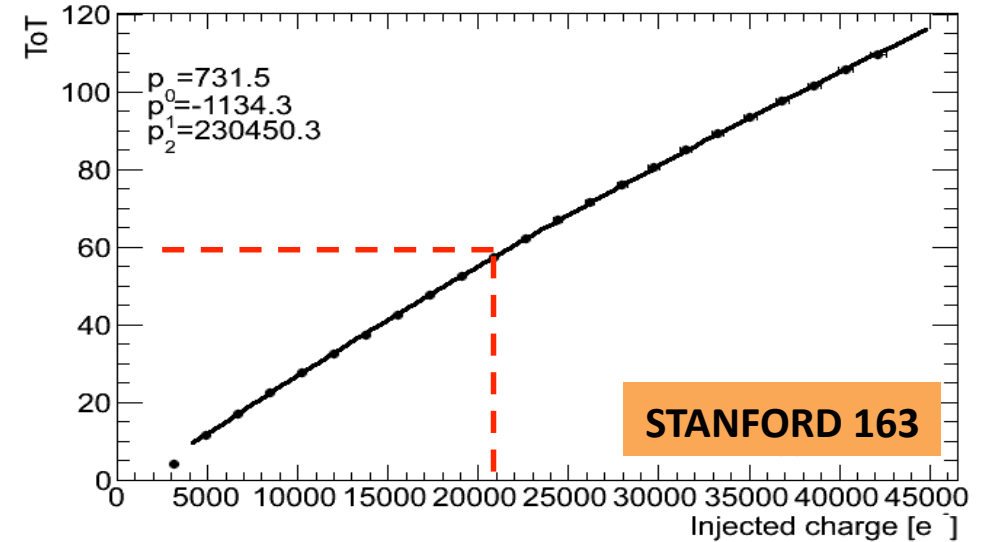
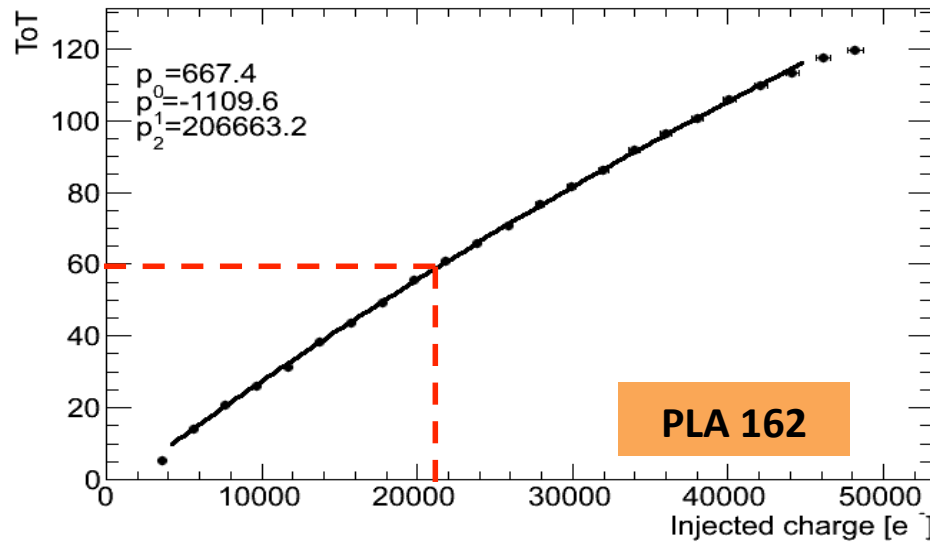
@ HV 100V, 120V → R = 1MΩ (for the others FBK 20kΩ)

<sup>3</sup> X: 16June-80V-Clow\_X.tot

<sup>5</sup> May TB configuration

<sup>4</sup> Oct TB configuration (Bat)

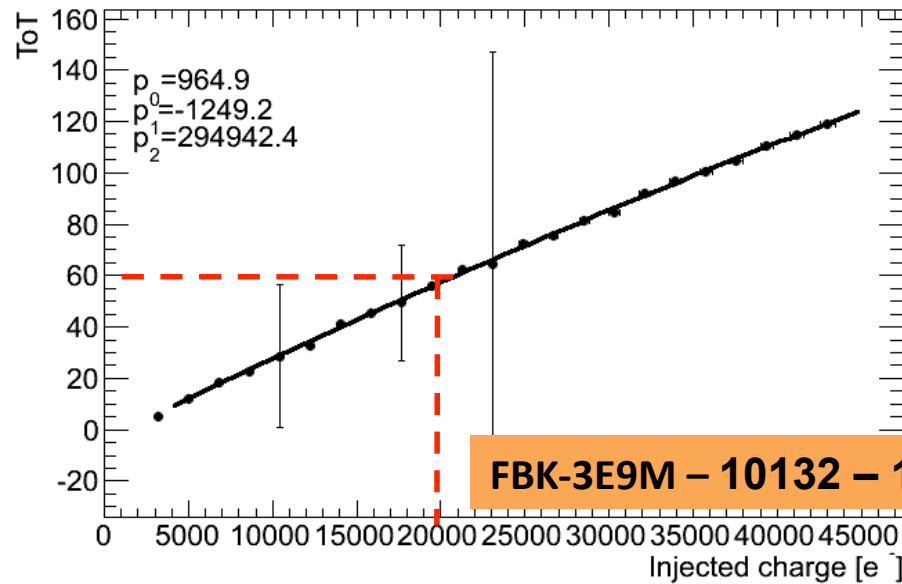
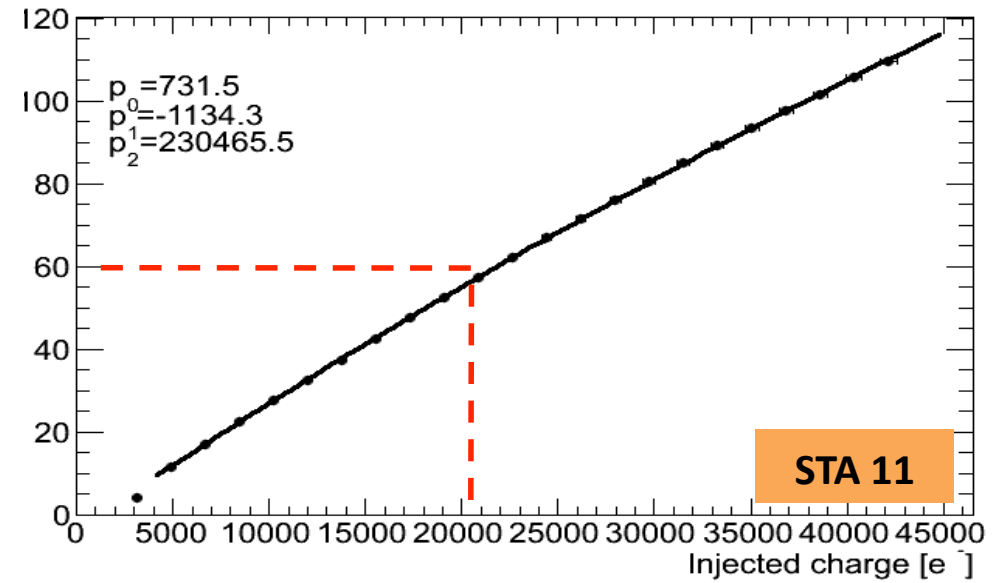
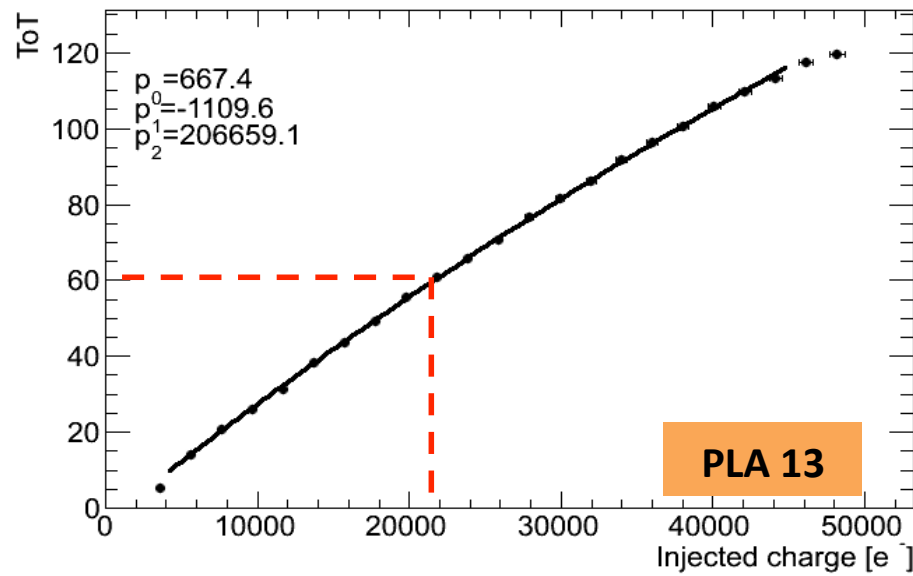
<sup>6</sup> Oct TB configuration (Eudet)



- Tuning:
  - ✓ Threshold  $\sim 3200 e^-$
  - ✓ 60 TOT @  $Q=20ke^-$

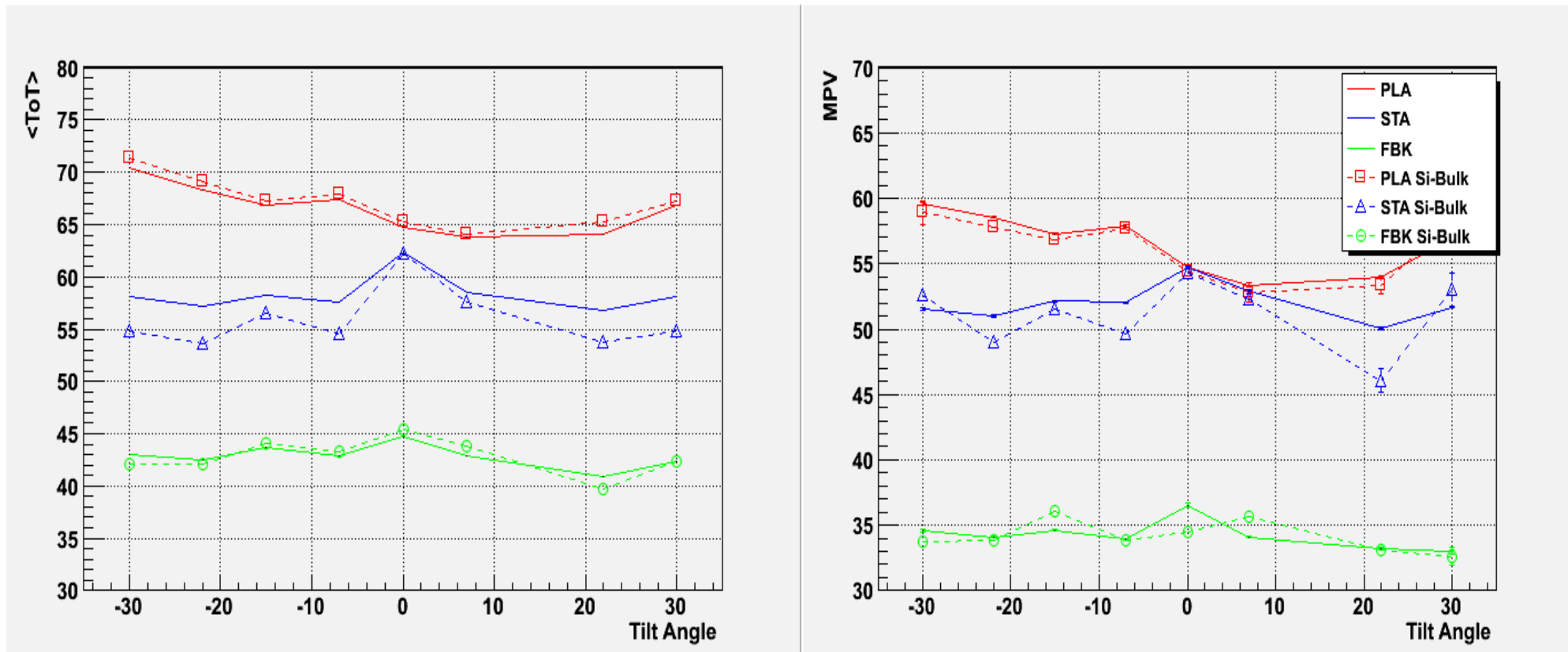


# ToT Calibration: Eudet Oct 2009



Tuning:

- ✓ Threshold ~ 3200 e<sup>-</sup>
- ✓ 60 TOT @ Q=20ke<sup>-</sup>



(a) Mean ToT vs tilt angle

(b) Most probable ToT vs tilt angle

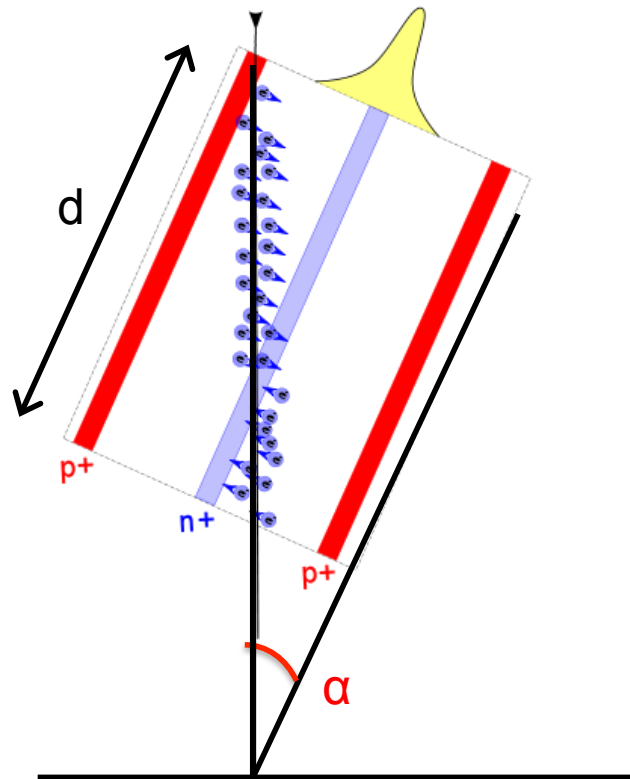
tracks:

outside electrode:  $15 < \text{track} \leq 20 \mu\text{m}$

plot (b):

errors only statistical - systematic error due to selected range

There was a funny shape with a peak at  $0^\circ$  that we have not totally understood --> idea was to redo these plots for tracks that are away from the electrodes



The collected charge depends of the path of the particle:

- tilted angle
- sensor thickness:
  - PLA 162 = 250  $\mu\text{m}$
  - STA163 = 208  $\mu\text{m}$
  - FBK165 = 200  $\mu\text{m}$

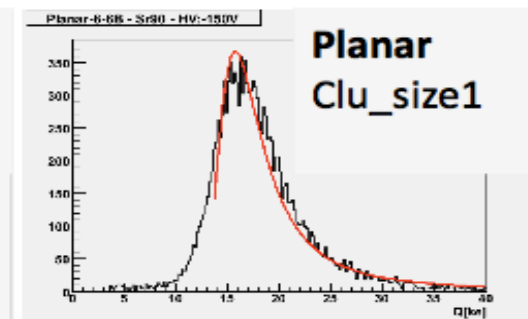
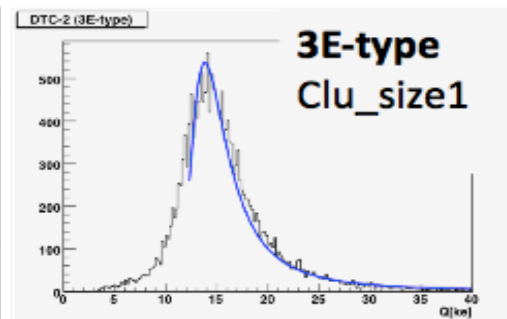
path =  $d / \cos(\alpha)$ :

- $Q_{\text{norm.}} = Q/\text{path} = Q/d \cdot \cos(\alpha)$

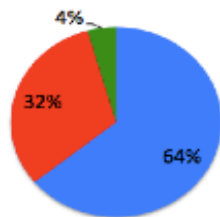
## Response to radioactive source (Sr90)

- Lab measurements (with external trigger)
  - DTC-2 versus Planar

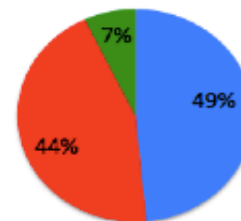
	V_BIAS V	MPV ke (Clu_size1)	MPV ke (Clu_size2)
2E-DTC2 (200um)	35	14.12 ± 0.03	15.36 ± 0.05
3E-DTC2 (200um)	35	14.07 ± 0.03	15.25 ± 0.02
4E-DTC2 (200um)	35	14.07 ± 0.03	15.25 ± 0.03
Planar (250um)	150	16.02 ± 0.03	17.66 ± 0.04



- Different charge collected in agreement to different sensors thickness



**DTC-2 3E-type**  
 Clu\_siz 1: 63%  
 Clu\_size 2: 32 %  
 Others: 4%

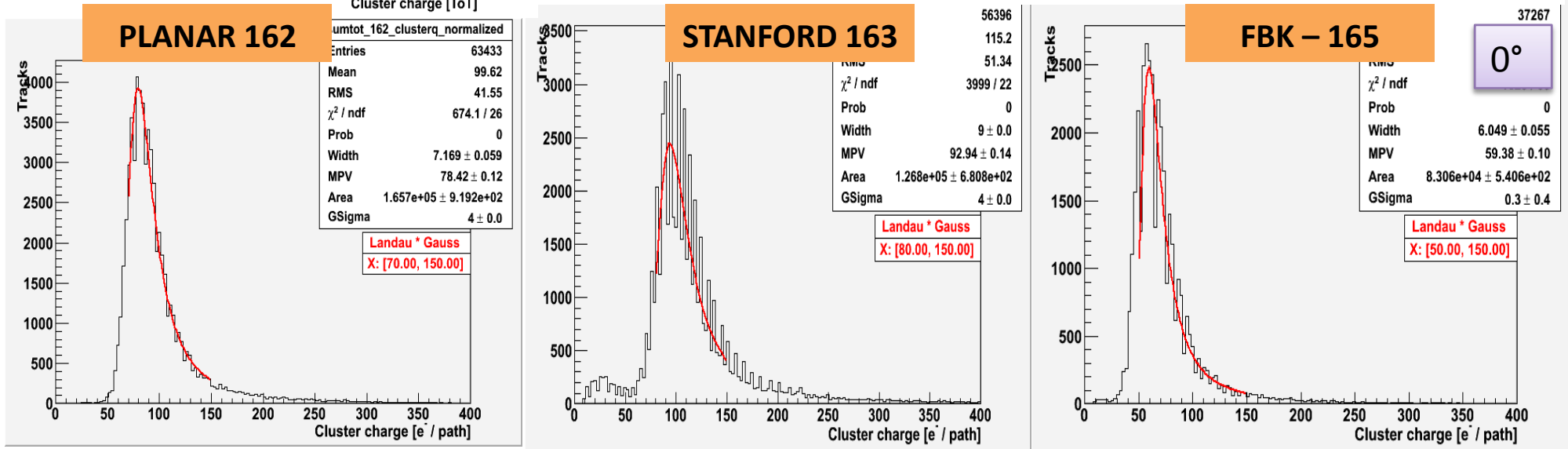
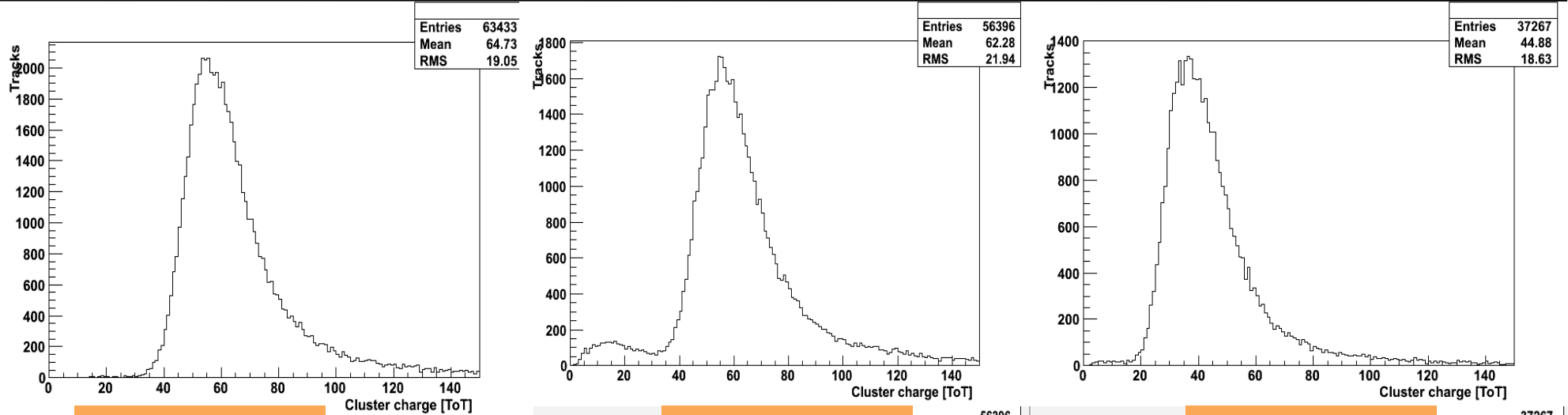


**Planar**  
 Clu\_siz 1: 49%  
 Clu\_size 2: 44 %  
 Others: 7%

- Less charge sharing



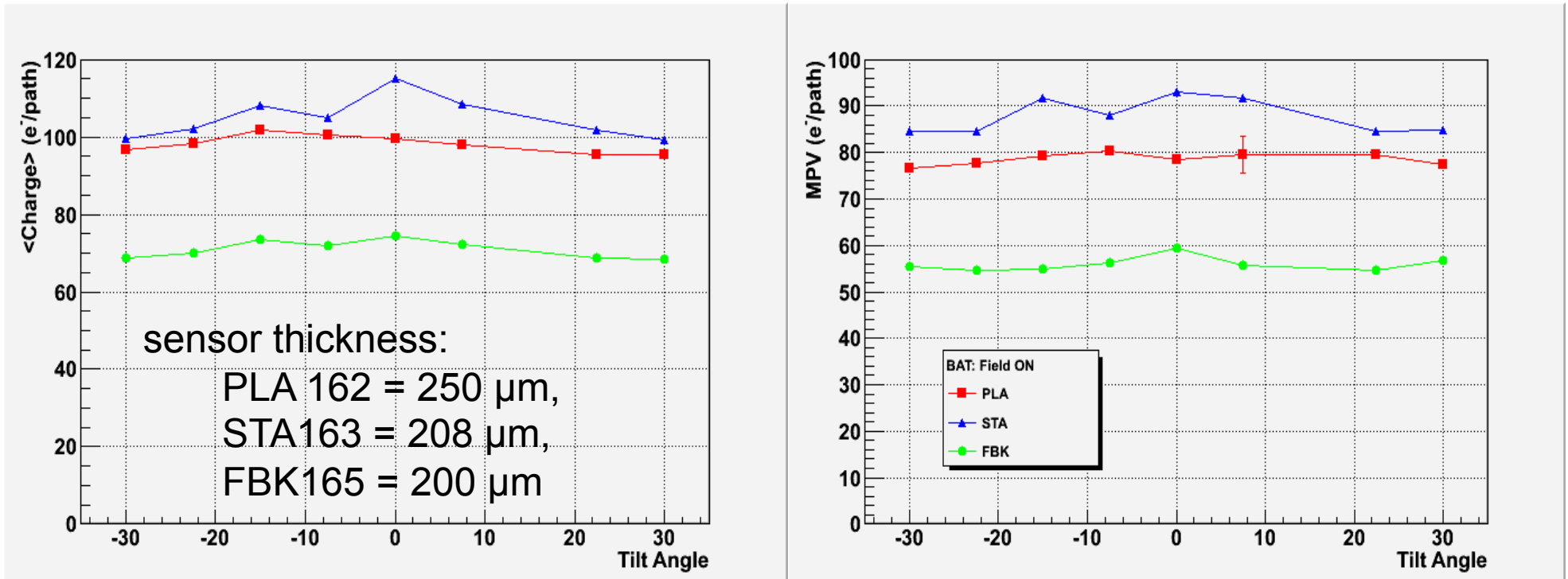
# Collected Charge



sensor thickness:

PLA 162 = 250  $\mu\text{m}$ , STA163 = 208  $\mu\text{m}$ , FBK165 = 200  $\mu\text{m}$

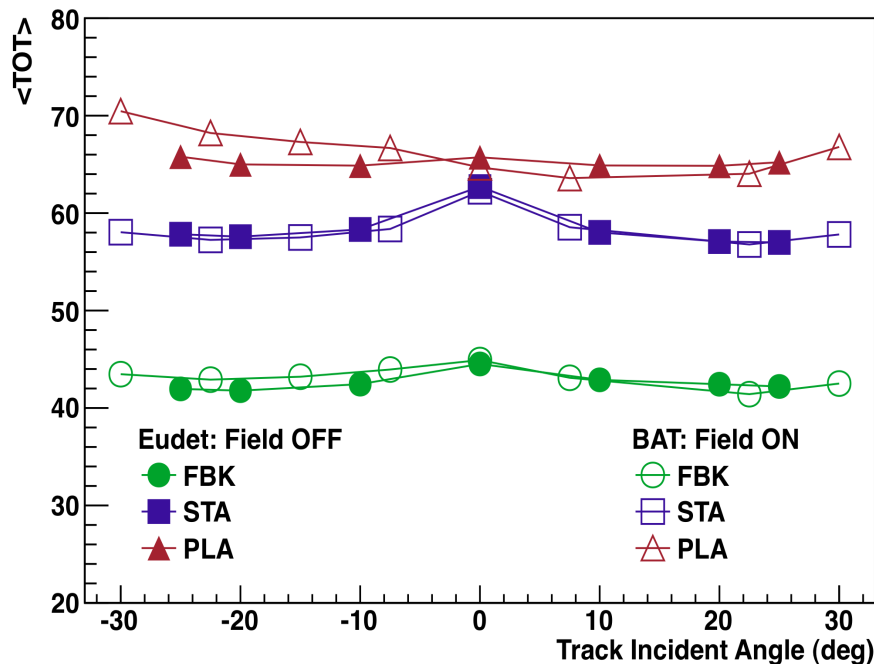




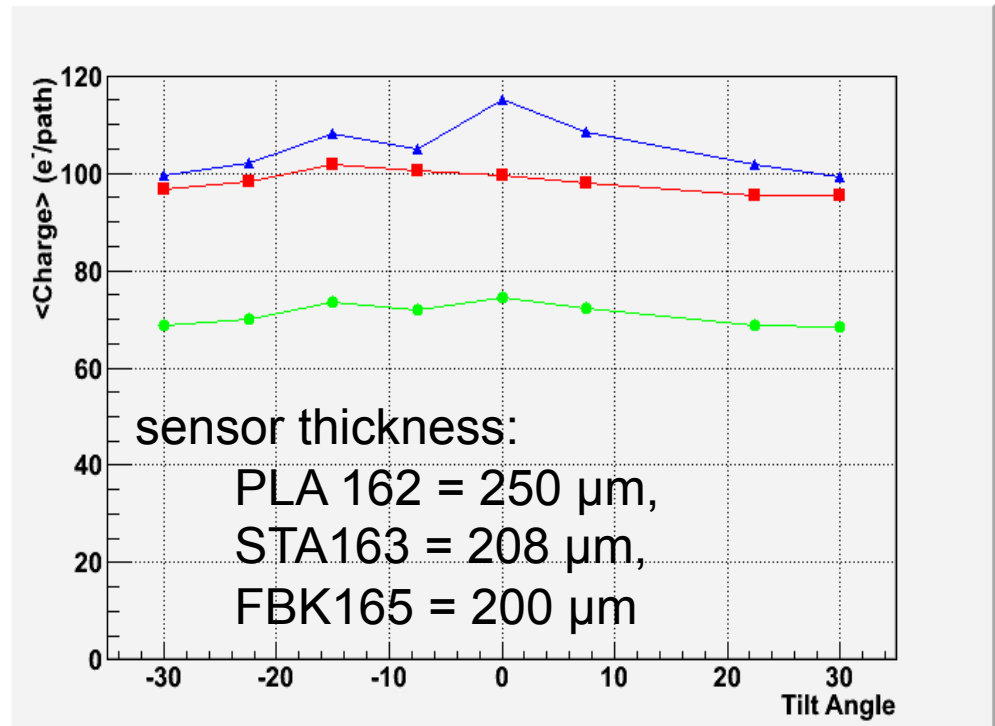
(a) Mean Charge vs tilt angle

(b) Most probable Charge vs tilt angle

- The peak at 0° is not complete disappeared.
- The trend is 'more' linear (especially for the planar)



(a) Mean TOT vs tilt angle



(b) Mean Charge vs tilt angle

- The peak at 0° is not complete disappeared.
- The trend is 'more' linear (planar)
- The planar sensor collect less charge considering the sensor thickness
- The FBK was not completed depleted  
 ✓ lower TOT, lower charge



# TOT to Charge conversion files

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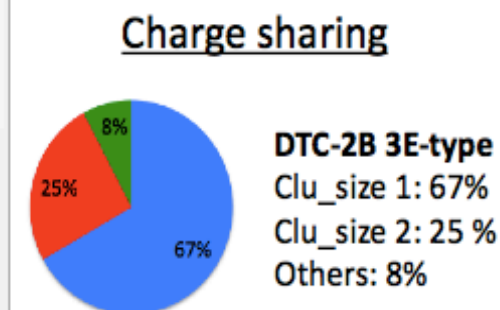
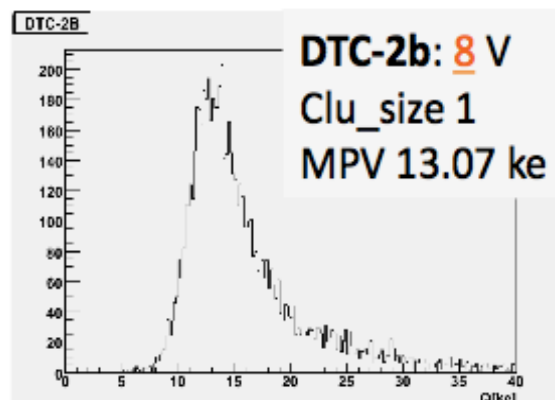
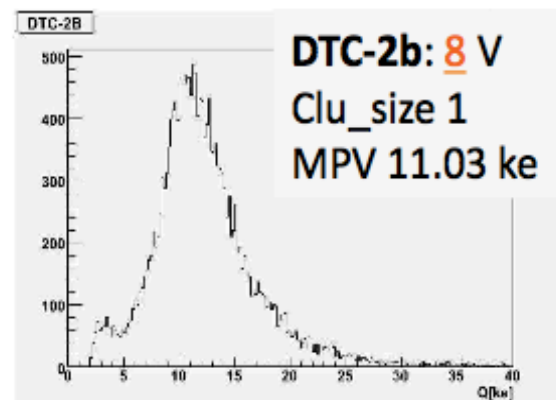
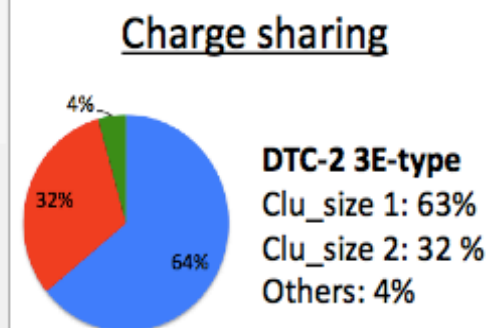
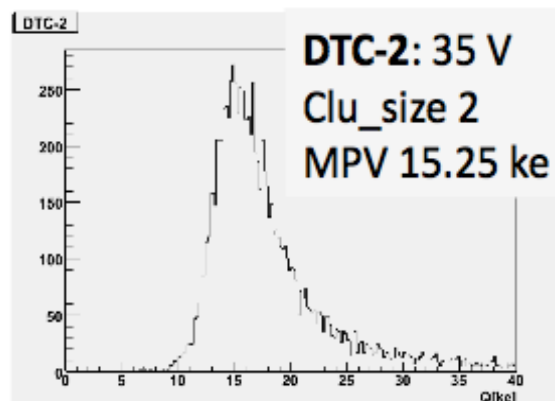
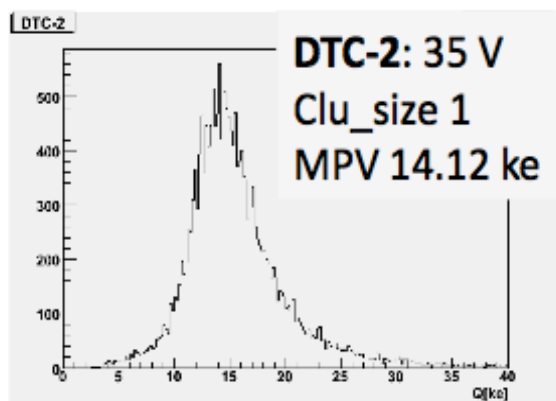
Backup

# Response to radioactive source ( $\text{Sr}^{90}$ )

- Lab measurements (with external trigger)

- DTC-2 versus DTC-2b

	DTC-2	DTC-2b
Column Overlap (um)	90-100	110-150

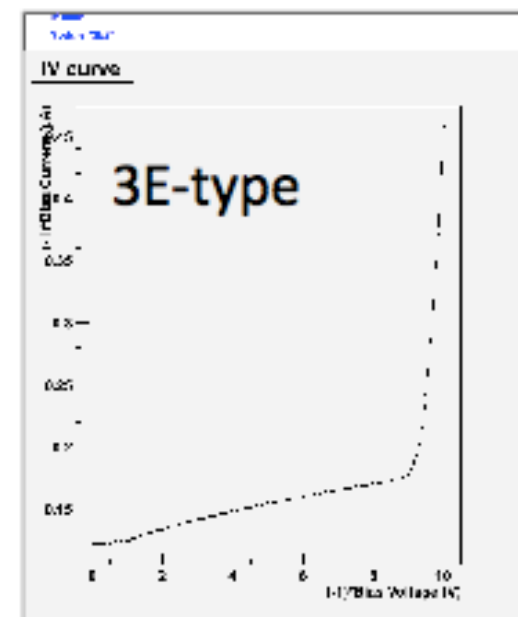
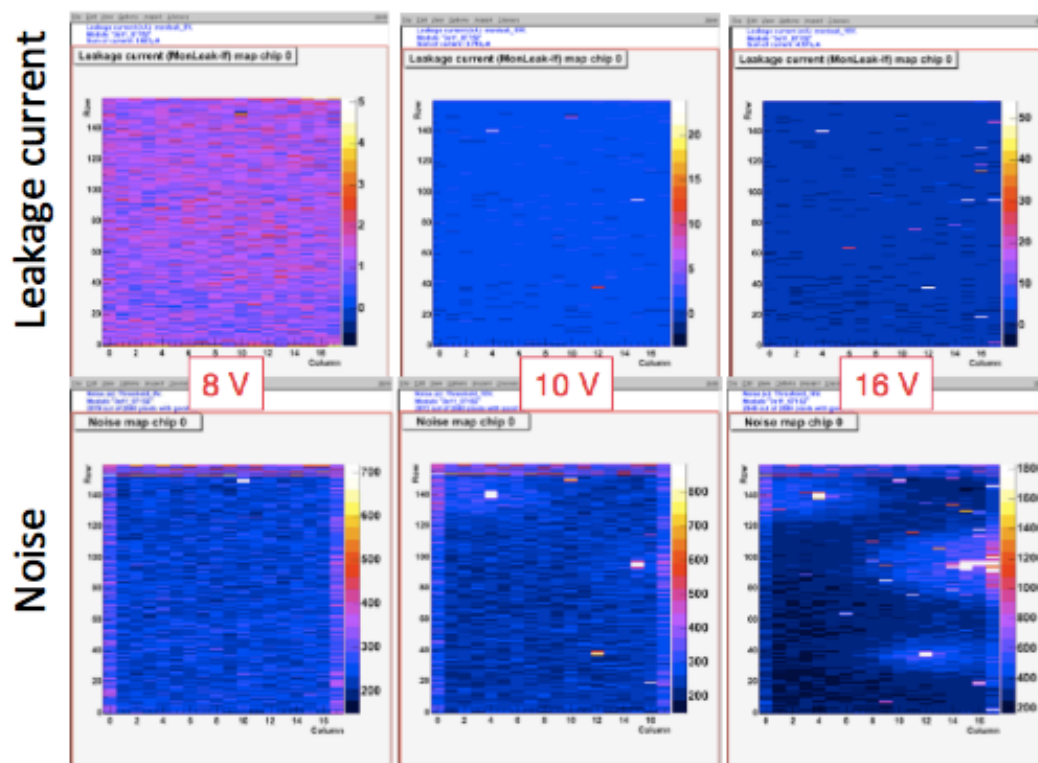


**DTC-2b lower charge than DTC-2**

**Operated with a lower bias voltage (about 8V) due to its early breakdown problem**

# Early breakdown problem (batch: DTC-2b)

- Early breakdown related to presence of local effects
- At about 10V the  $I_{leak}$  starts to rise and few pixels become very noisy compared to the others
- Increasing the  $V_{bias}$  the number of noisy pixels increases



Depletion Voltage  $\sim 4V$