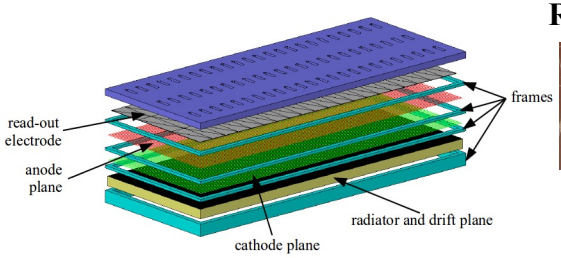
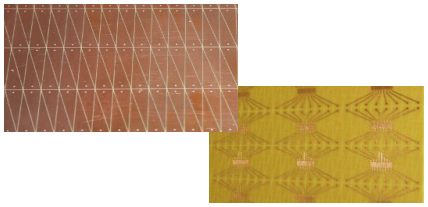
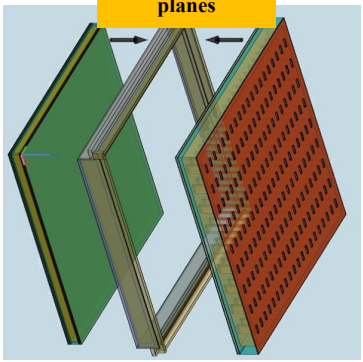
2011 – 2012 prototypes



Readout electrode

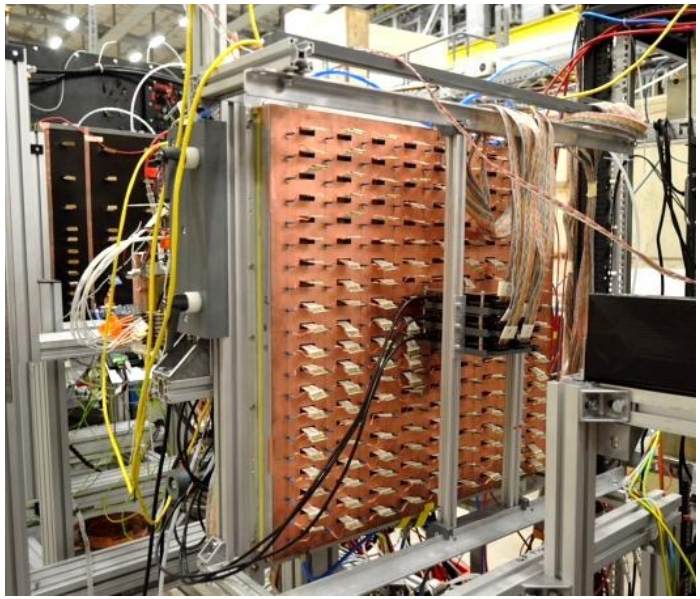


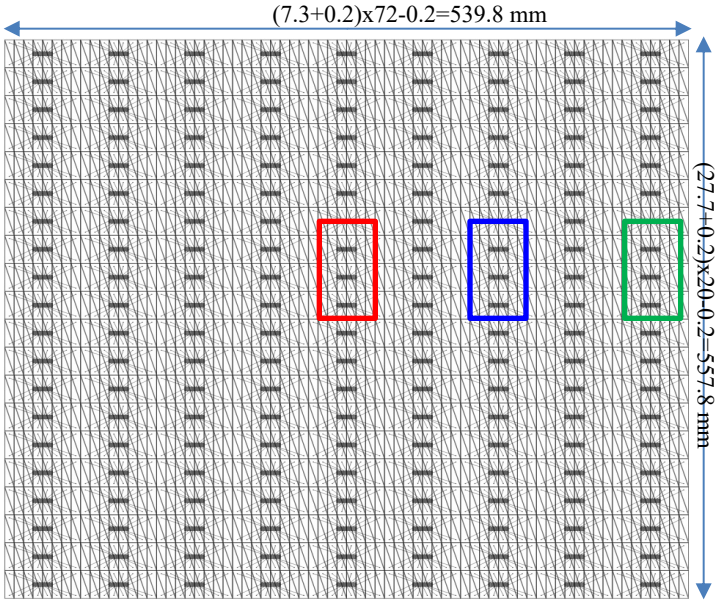
Signal transport topology

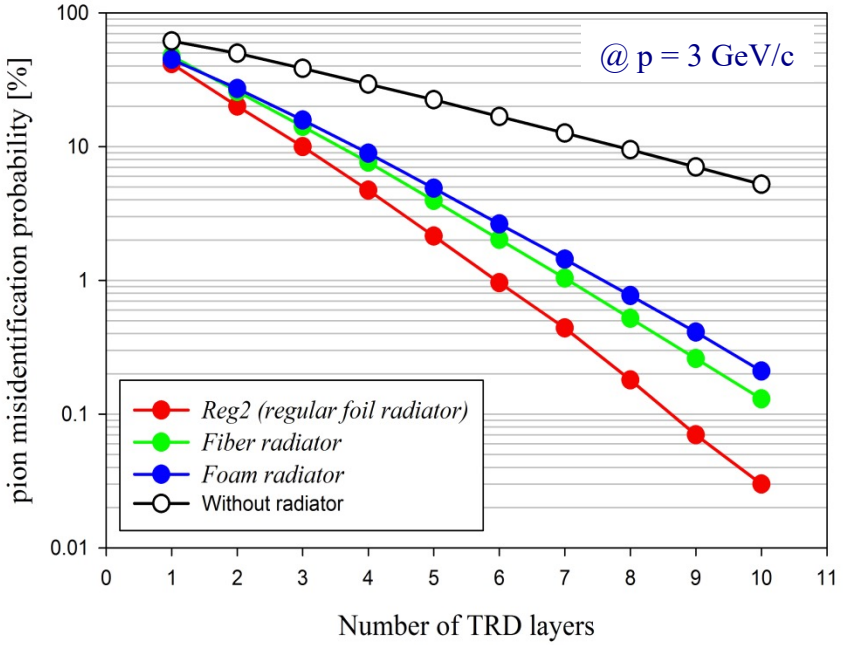


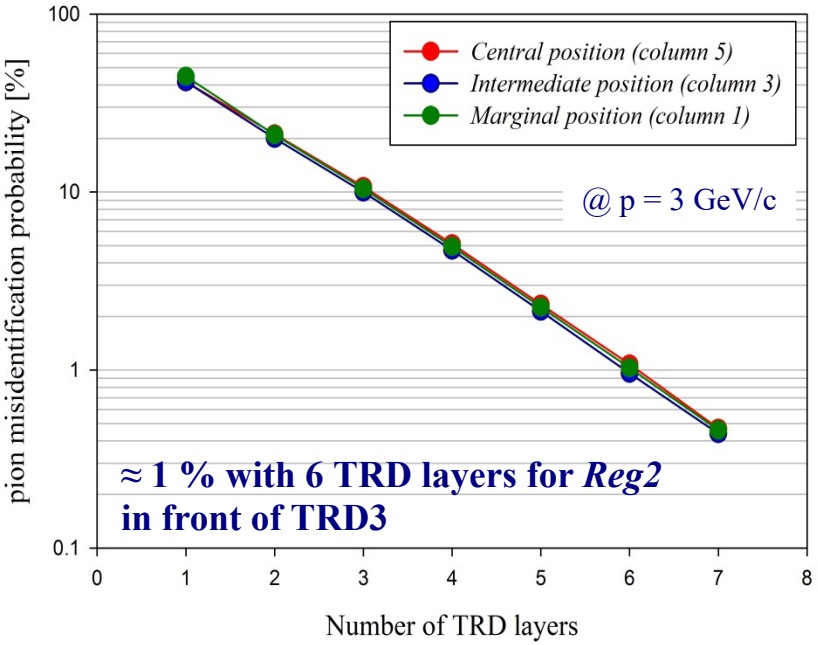
Prototype	TRD 2011 – small prototype	TRD 2012 – real size prototype
Feature		
architecture	single MWPC (2 x 4 mm amplification region) + 4 mm drift region	
A – K gap	4 mm	
anode plane	20 µm gold plated W wires, 3 mm wire pitch	
cathode plane	70 µm Cu-Be wires, 1.5 mm wire pitch	
drift electrode	8mm Rohacell plate + 20 µm Al kapton	20 µm Al kapton + 3 mm Rohacell + 9 mm honeycomb + 3 mm Rohacell + 20µm Al kapton
readout electrode	PCB 300 µm; triangular shape of pads; readout cell area (0.7 x 2.7)/2 ≈ 1 cm2	
	192 triangular pads and total area of 8 x 29 cm2	rows: 20; columns: 9 ; pads/row: 144; 2880 triangular pads and total area of 60 x 60 cm2

e/π discrimination TRD 2012 prototype

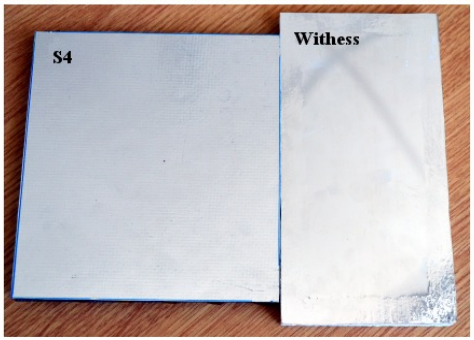




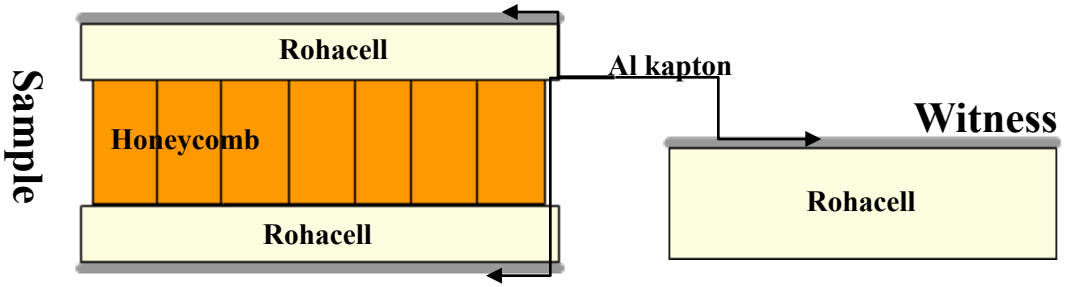




CBM-TRD prototype – absorption tests



- operated detector: **TRD 2012 prototype**
- gas mixture: Ar+CO2 (80%+20%)
- HVa=1900V & HVd=600V
- a collimated 55Fe source

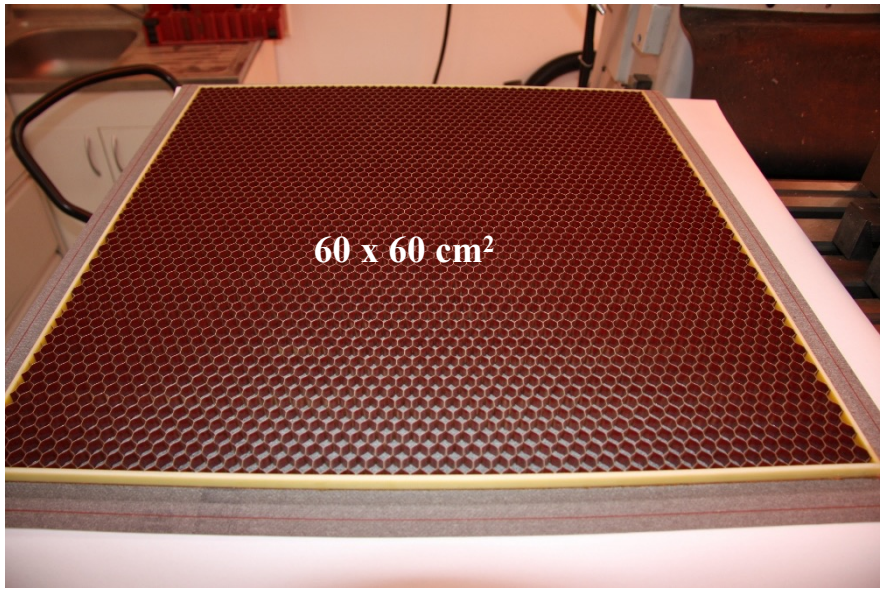


Characteristic	S1	S2	S3	S4	Witness
Rohacell thickness [mm]	2 x 3	2 x 3	2 x 3	-	8
Honeycomb thickness [mm]	9	6	6	9	-
Φ-honeycomb cell	9.6	6.4	6.4	9.6	-
Honeycomb density [kg/m3]	48	48	32	48	-
Al kapton thickness [μm]	2 x 20	2 x 20	2 x 20	-	20
Absorption [%]	56.23**	56.75	55.03	48.12	58.20*

- *The main absorber is the Rohacell plate.*
- *The type of honeycomb plate used for the drift electrode matters the least.*
- *S4 (**2 x Al carbon fiber of ~300μm + honeycomb plate**) has a transmission 25% better than the witness sample, and 10% better than the samples with a honeycomb + Rohacell structure.*

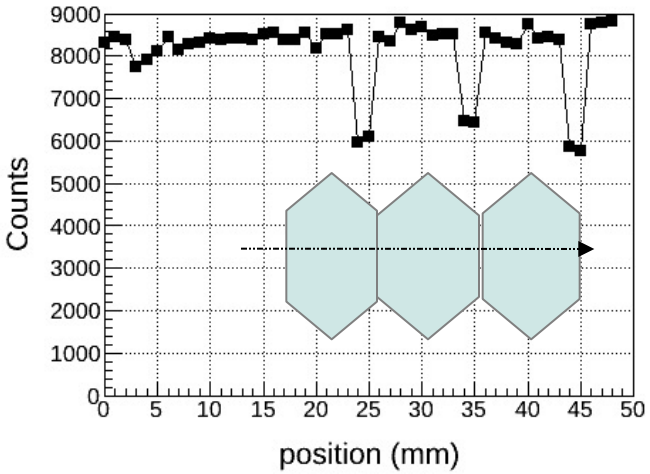
drift electrode for TRD2011
****drift electrode for TRD2012***

Drift electrode based on thin carbon layers



? ?

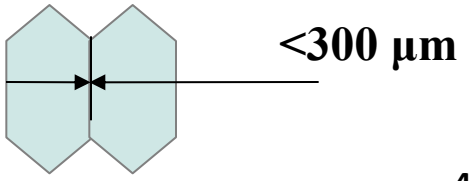
P4 sample: 100 µm C/honeycomb(9.6 mm cell) 100 µm C



Φcoll = 1 mm

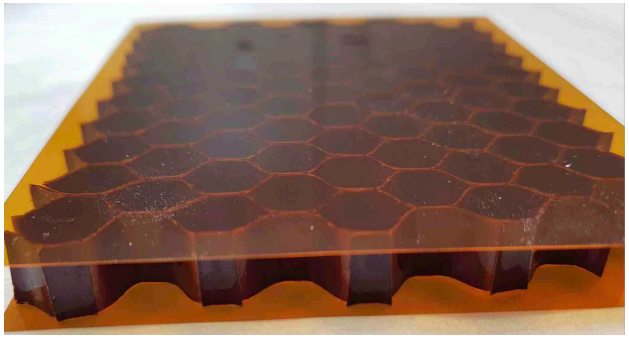
Scan step = 1 mm

30% increased absorption in the honeycomb walls, but the honeycomb walls are less than 5% of the honeycomb volume



Rough estimates of absorption for the new configuration

10x10 cm^2 sample: 70 µm kapton/honeycomb(9.6 mm cell)/70 µm kapton



The sample 150 µm C/honeycomb(9.6 mm cell)/150 µm C has a transmission of ~52%

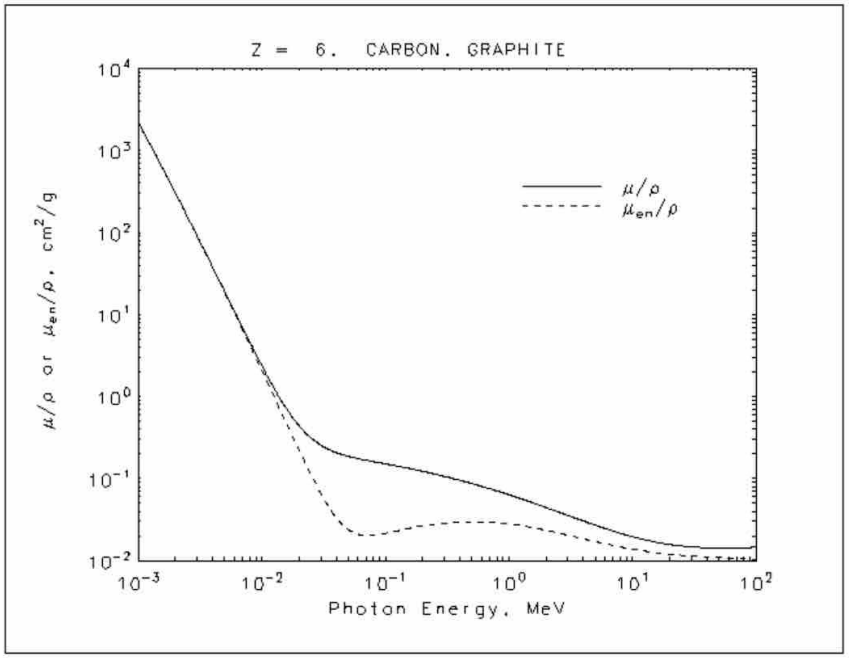
$$I = I_0\, e^{-\mu \cdot x} \quad \Rightarrow \quad \mu \cong 3.26\ mm^{-1}$$

$$if\ \mu^{carbon\ fiber} = \mu^{kapton} \quad \Rightarrow \quad 74\%\ transmission$$

$\rho^{diamond} = 3.52\ g/cm^3$
$\rho^{graphite} = 2.25\ g/cm^3$
$\rho^{amorphous} = 1.90\ g/cm^3$
$\rho^{carbon\ fiber} = 2.00\ g/cm^3$

$\rho^{kapton} = 1.42\ g/cm^3$

X-ray absorption



$$I = I_0 e^{-[(\mu/\rho)\cdot x]}$$

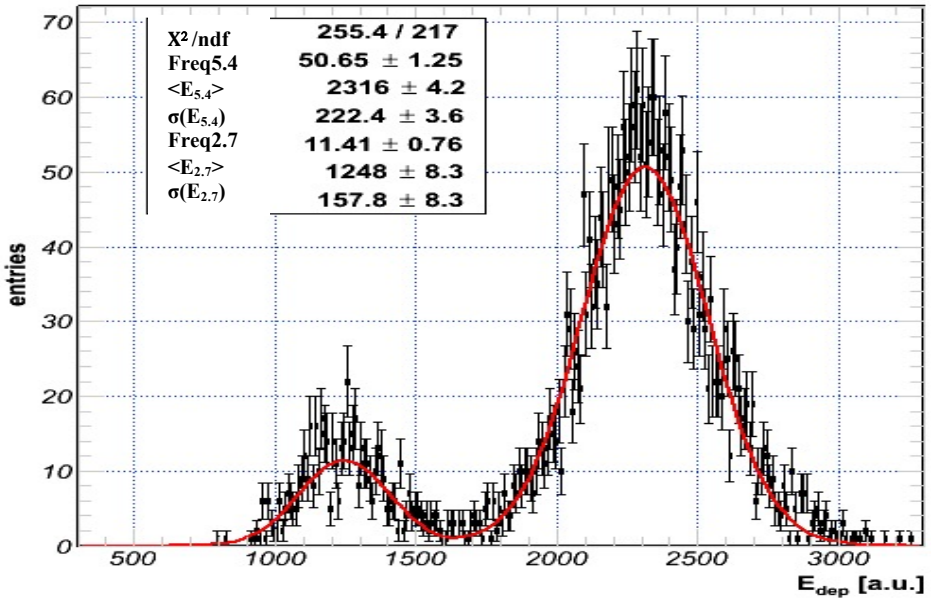
x - mass thickness = $\rho \cdot t$
t - thickness

$$I/I_0^{(200\ \mu m\ C)} \cong 0.64$$

$$I/I_0^{(300\ \mu m\ C)} \cong 0.48$$

-the mass attenuation coefficient - μ/ρ
-the mass energy-absorption coefficient - μ_{en}/ρ

A trivial & precise ^{55}Fe absorption measurement device to be setup ASAP
- Laura
- Cara
- Bugi
- Daniel - training
- Mariana for advice


X² /ndf 255.4 / 217
Freq5.4 50.65 ± 1.25
<E5.4> 2316 ± 4.2
σ(E5.4) 222.4 ± 3.6
Freq2.7 11.41 ± 0.76
<E2.7> 1248 ± 8.3
σ(E2.7) 157.8 ± 8.3
entries
Edep [a.u.]
0
10
20
30
40
50
60
70
500
1000
1500
2000
2500
3000