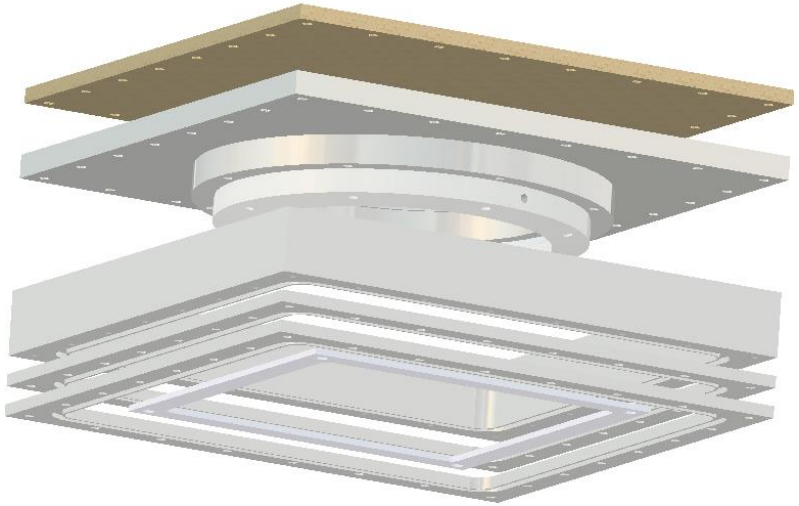
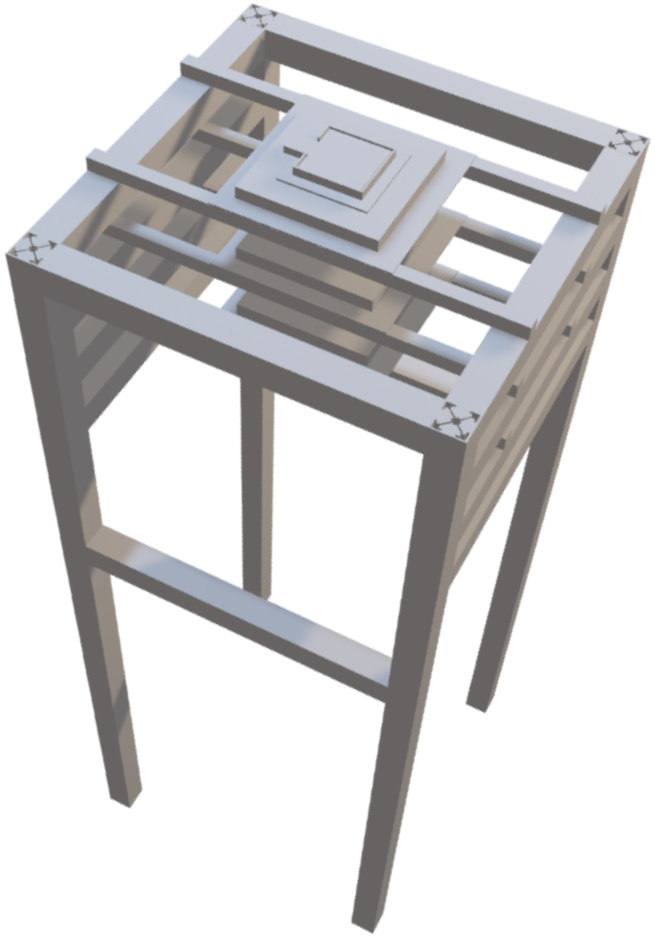
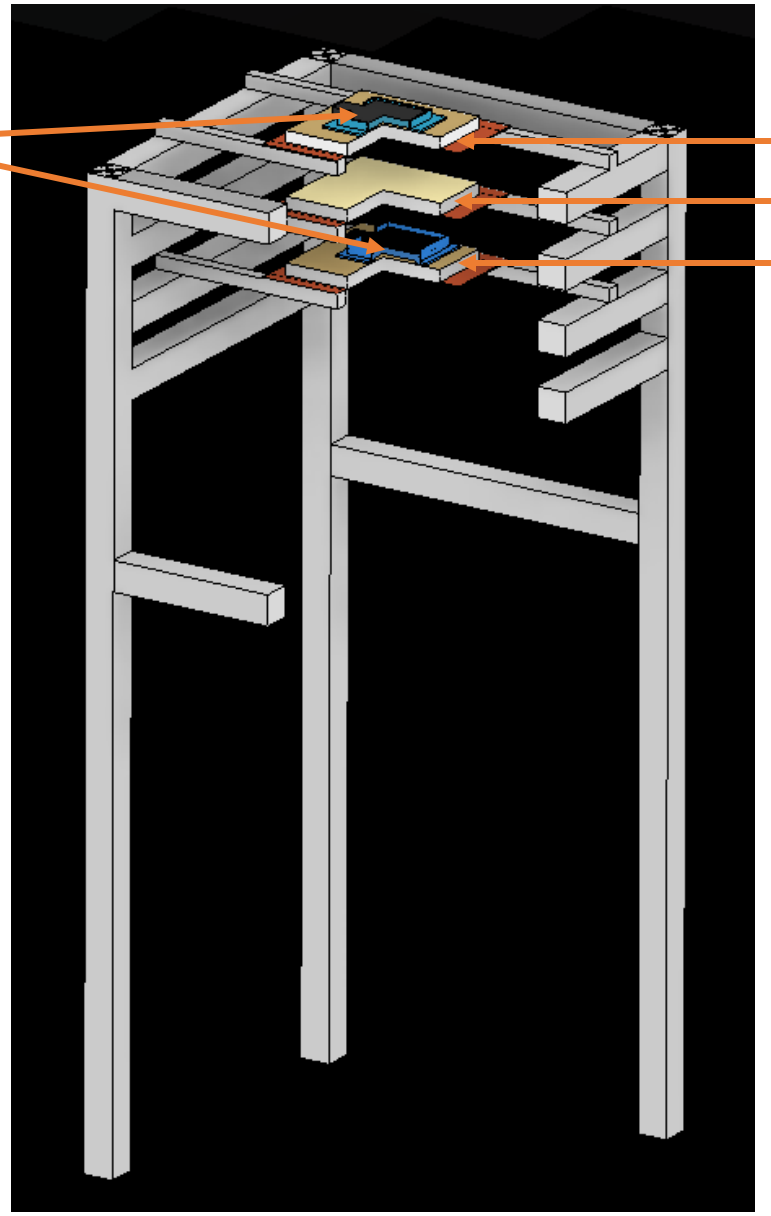
Development of a Cherenkov Micromegas

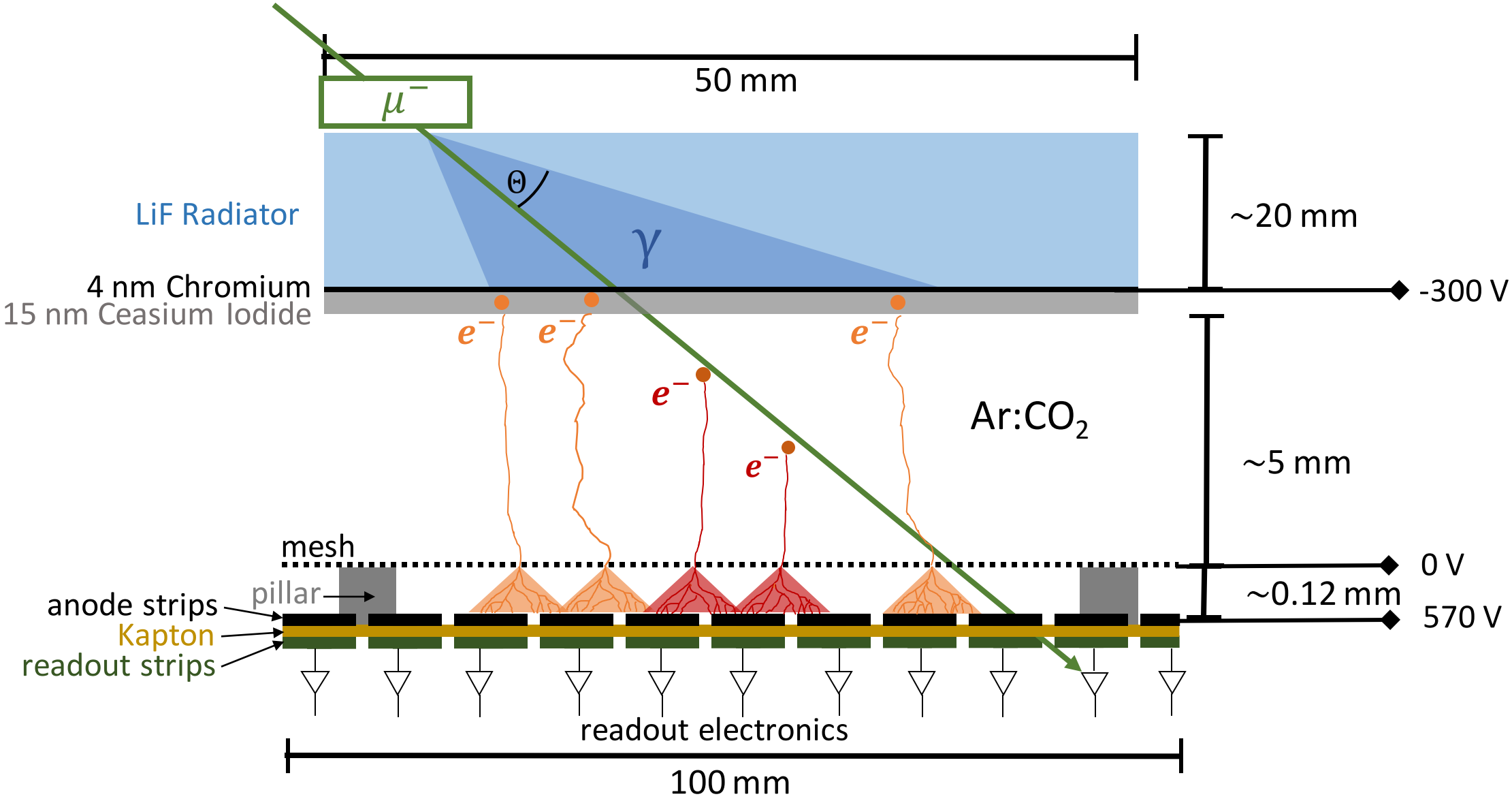
Daniel Grewe



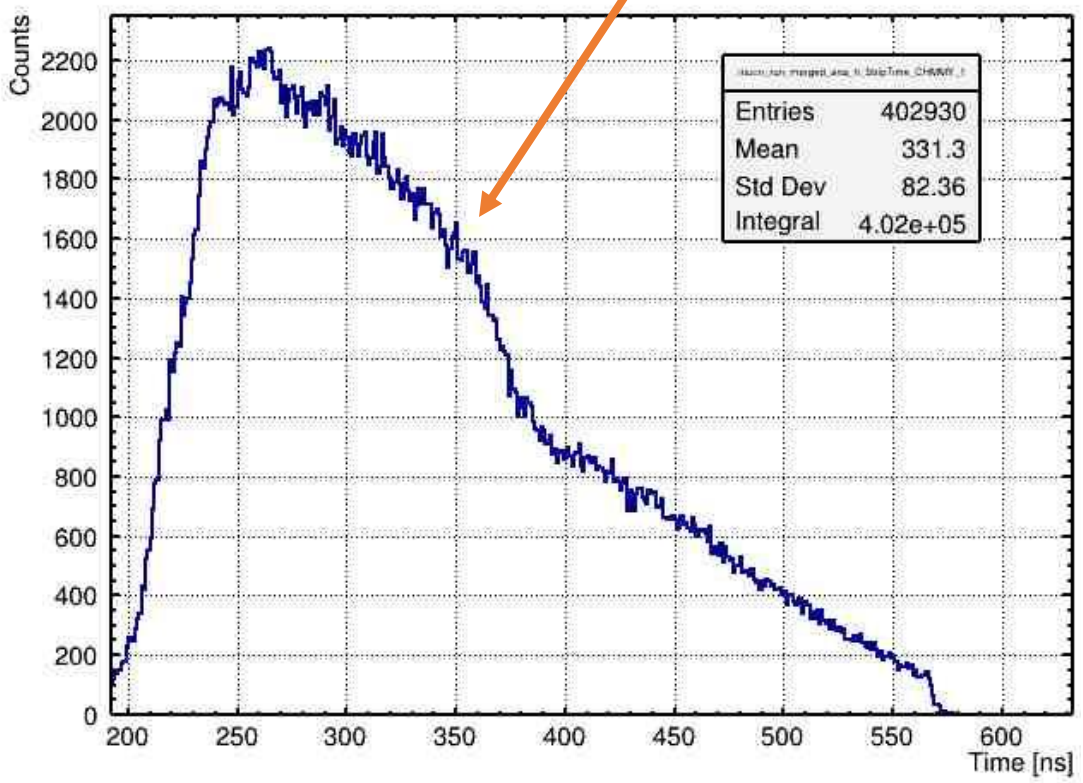
$-20^{\circ} < \theta < 20^{\circ}$

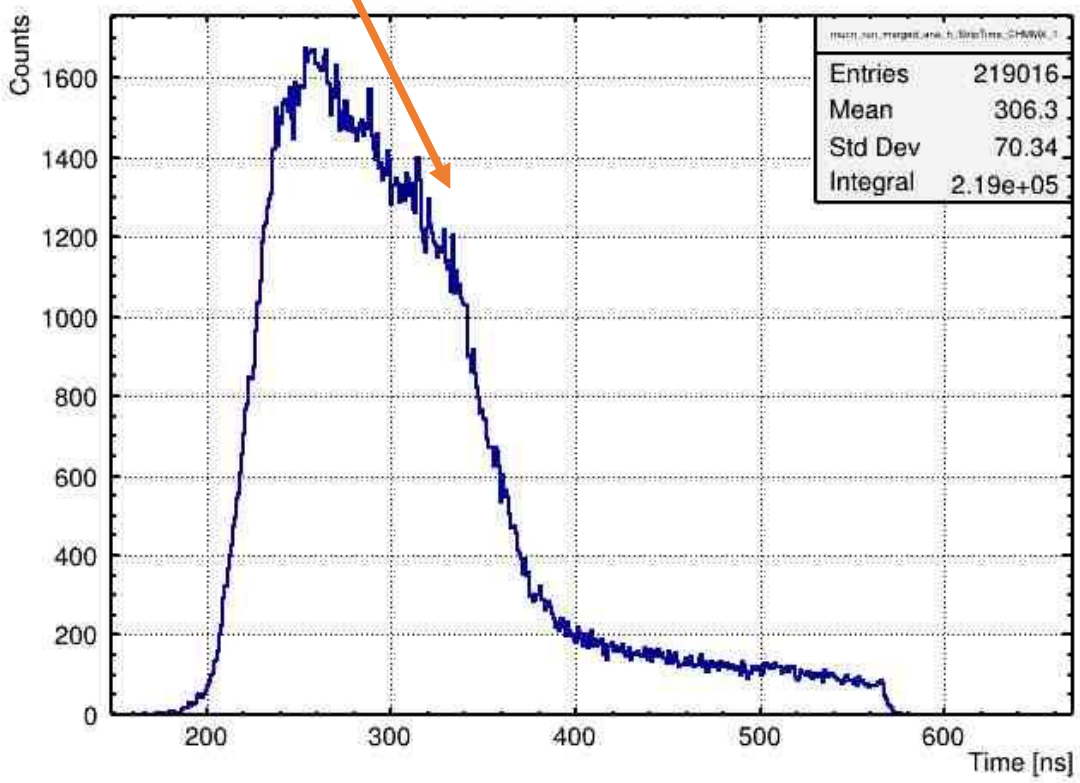


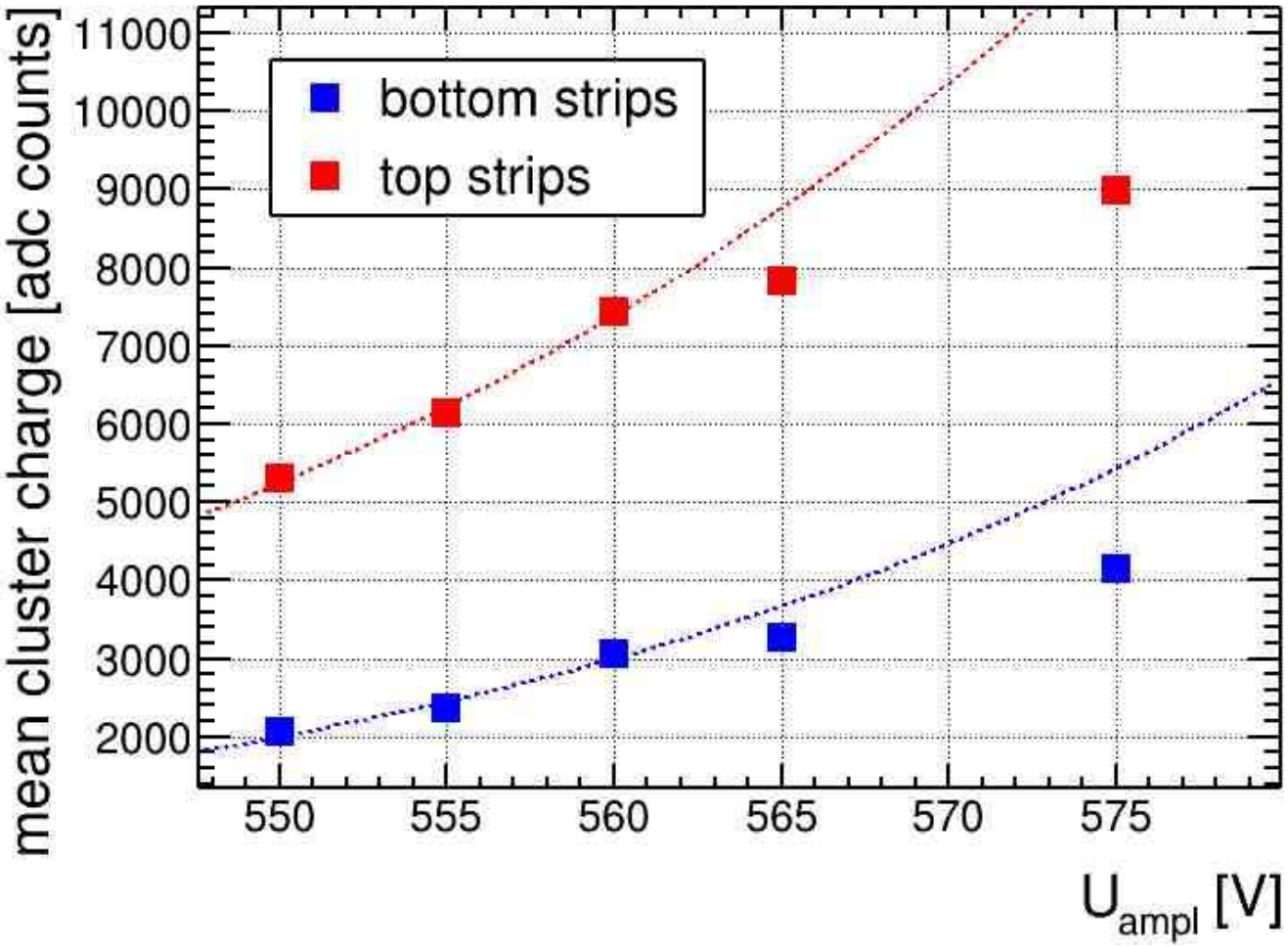



50 mm
μ^-
LiF Radiator
Θ
γ
~20 mm
4 nm Chromium
15 nm Ceasium Iodide
-300 V
e^-
e^-
e^-
e^-
e^-
Ar:CO_2
~5 mm
mesh
0 V
pillar
~0.12 mm
anode strips
Kapton
570 V
readout strips
readout electronics
100 mm

no peak visible =>
no cherenkov photons



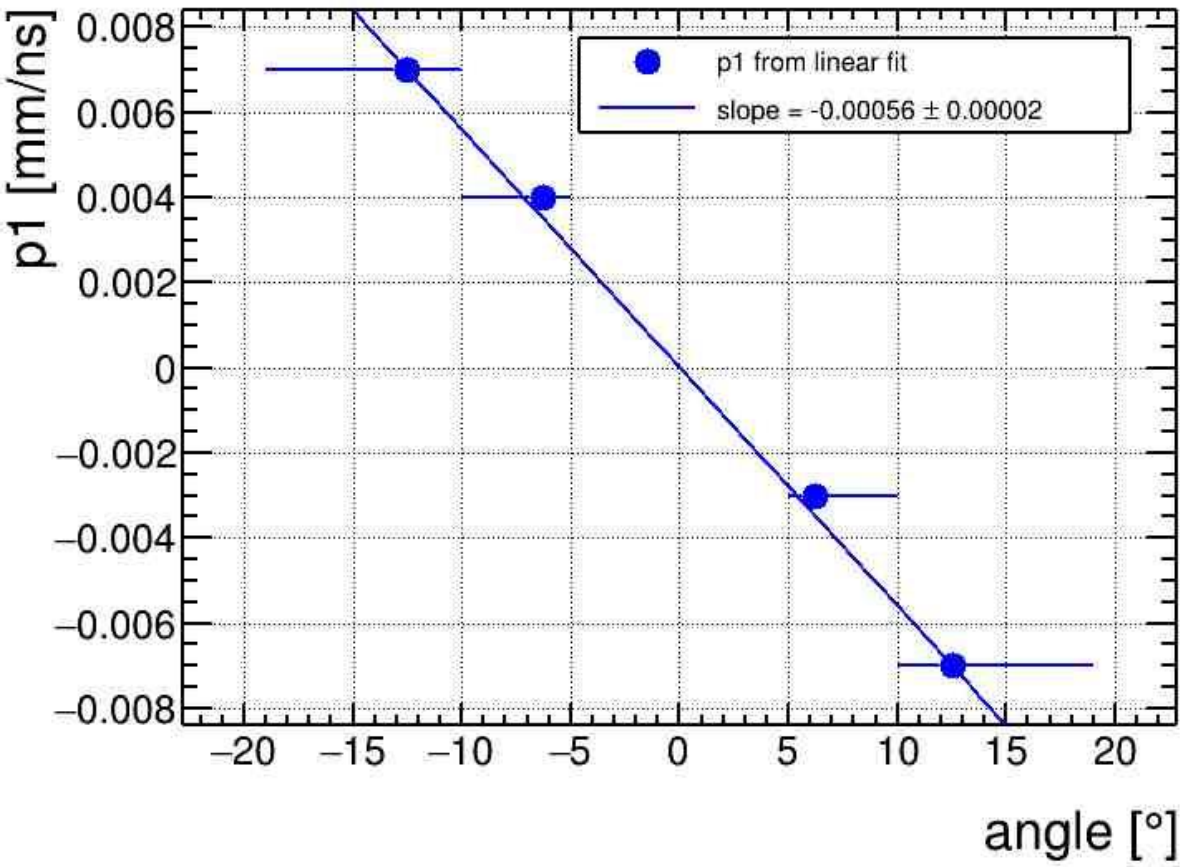


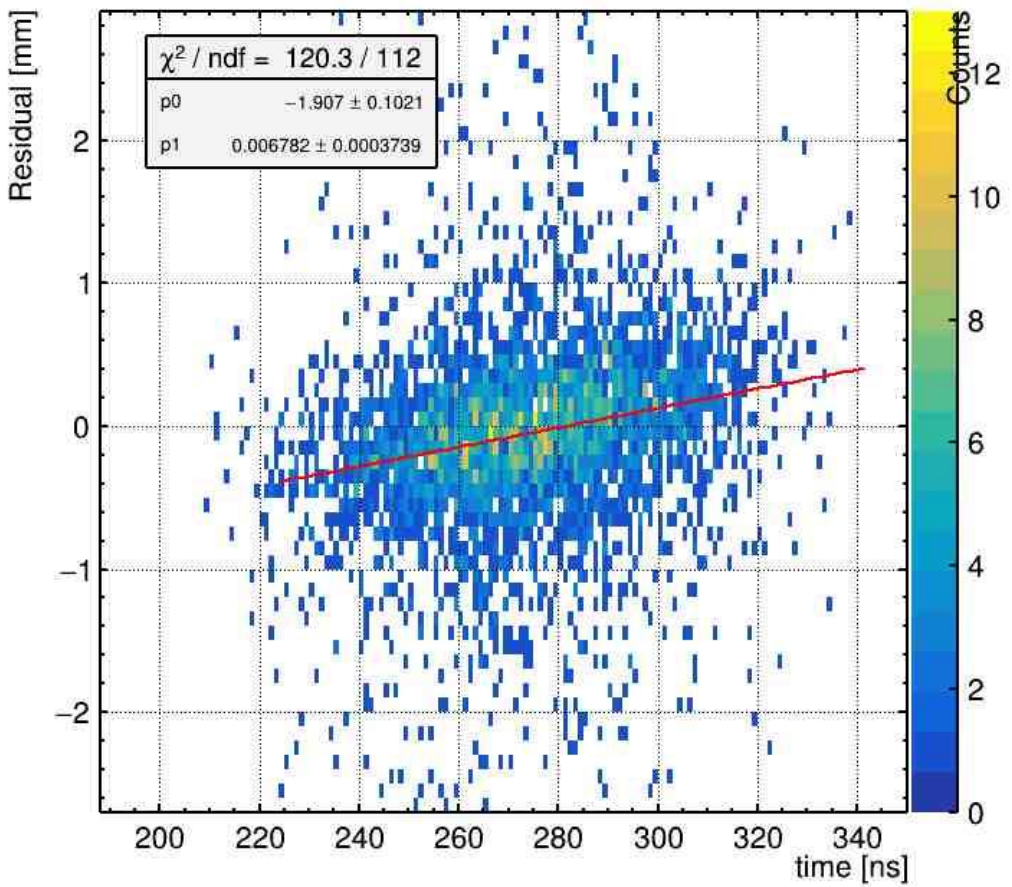

mean cluster charge [adc counts]
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
bottom strips
top strips
550
555
560
565
570
575
U_ampl [V]

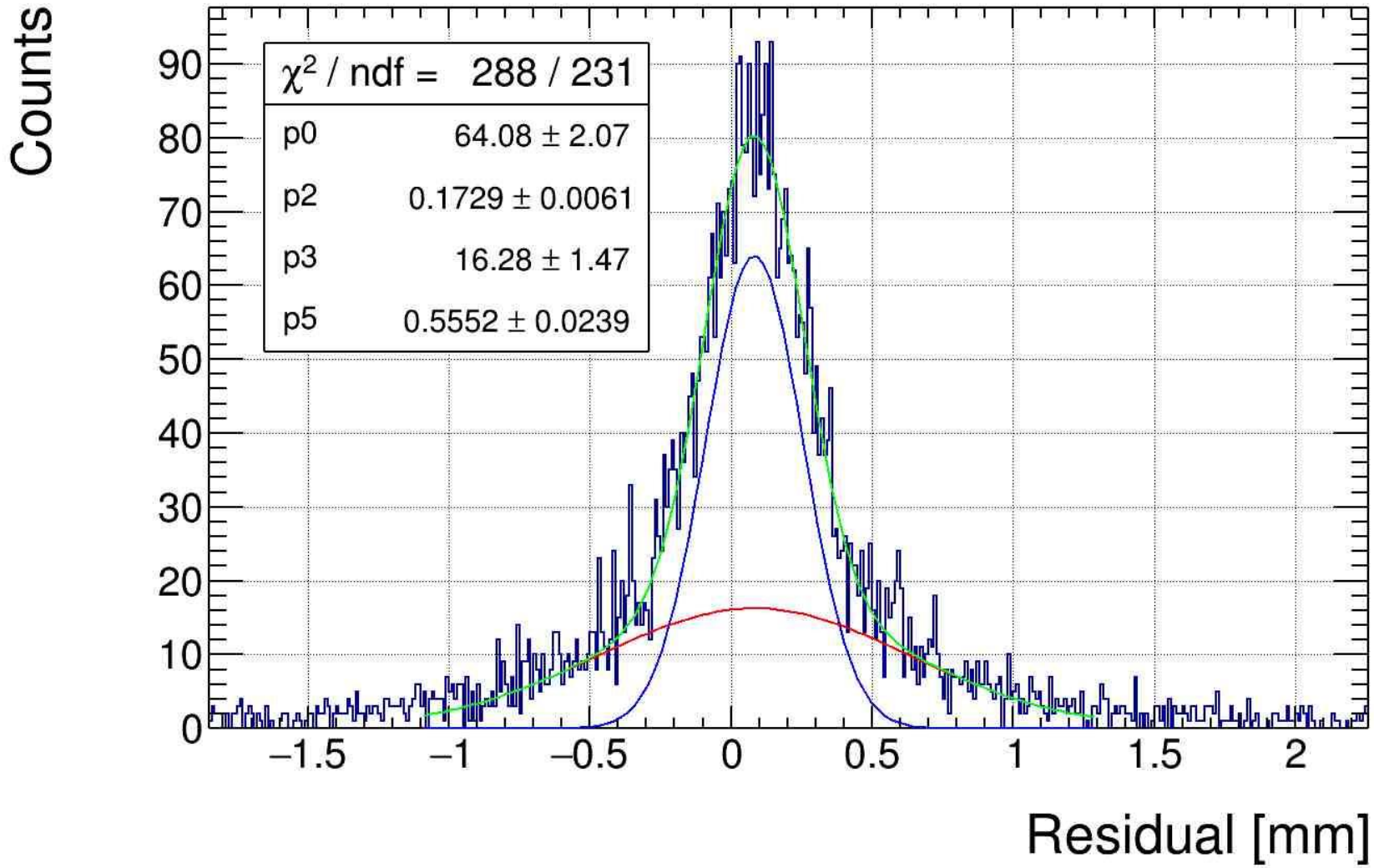
theory : $\Delta x = (t_{mid} - t_{coc}) \cdot v_D \cdot \tan(\theta)$

$\Delta x = (t_{mid} - t_{coc}) \cdot \text{slope} \cdot \theta$

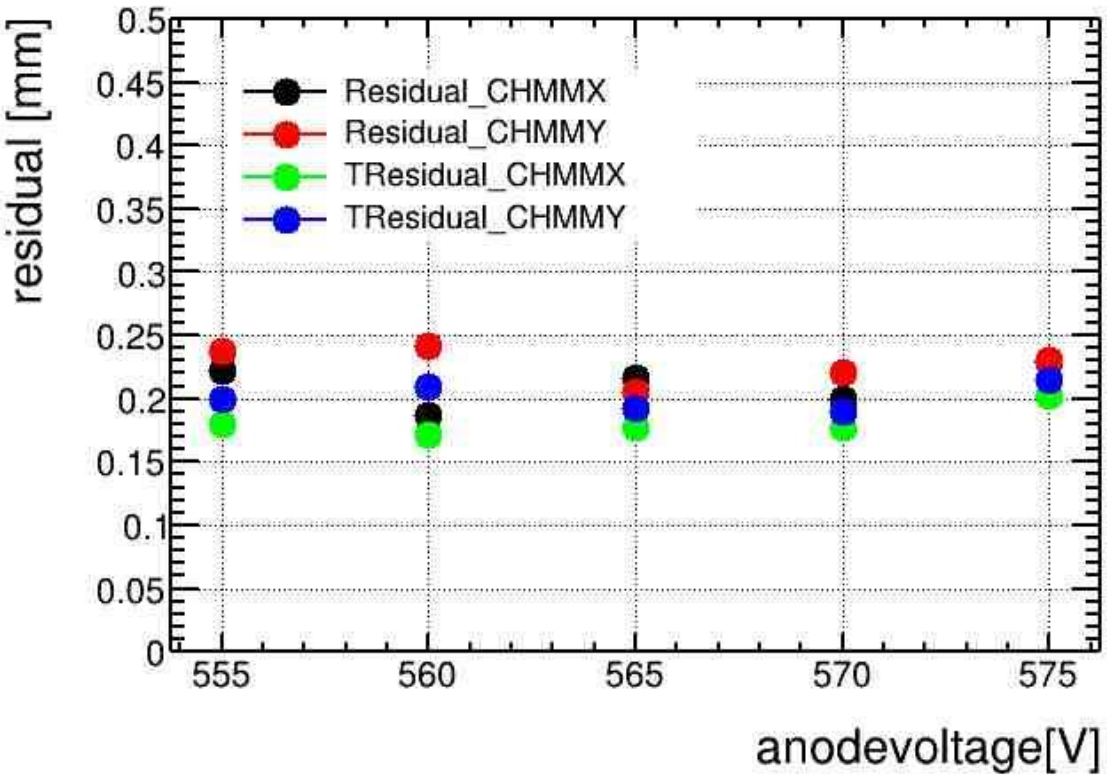
$$t_{coc.} = \frac{\Sigma\, q_i\, t_i}{\Sigma\, q_i}$$



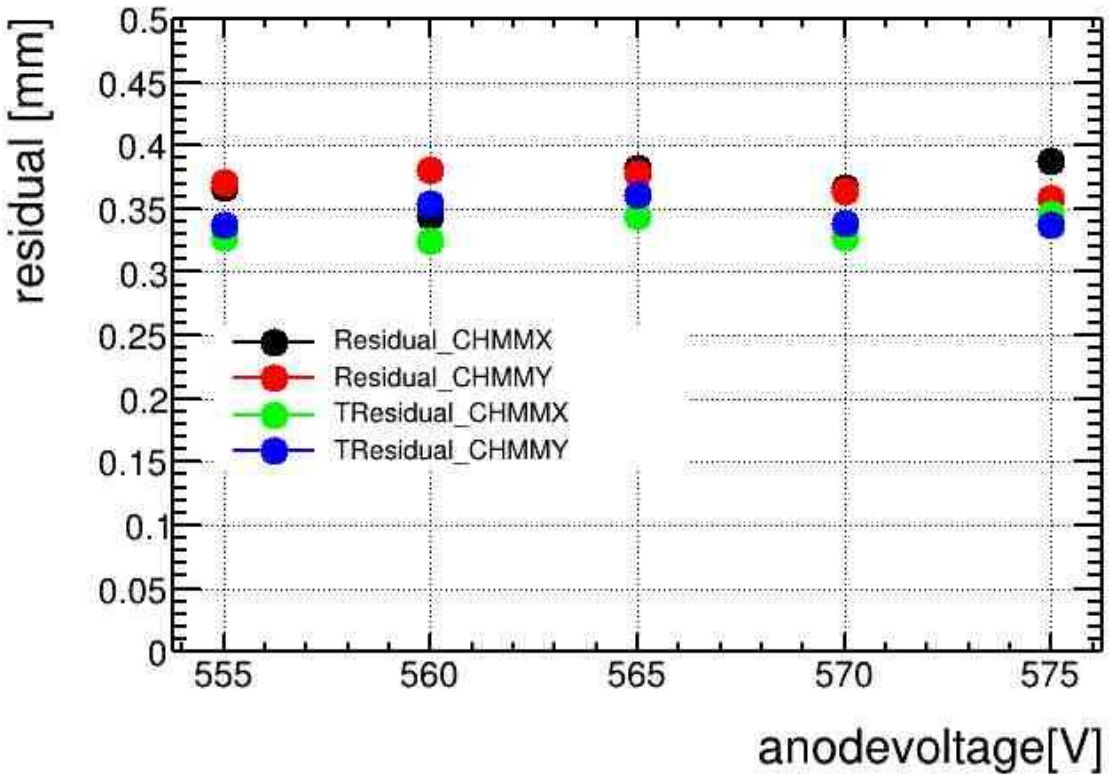



Counts
χ^2 / ndf = 288 / 231
p0 64.08 ± 2.07
p2 0.1729 ± 0.0061
p3 16.28 ± 1.47
p5 0.5552 ± 0.0239
90
80
70
60
50
40
30
20
10
0
−1.5
−1
−0.5
0
0.5
1
1.5
2
Residual [mm]

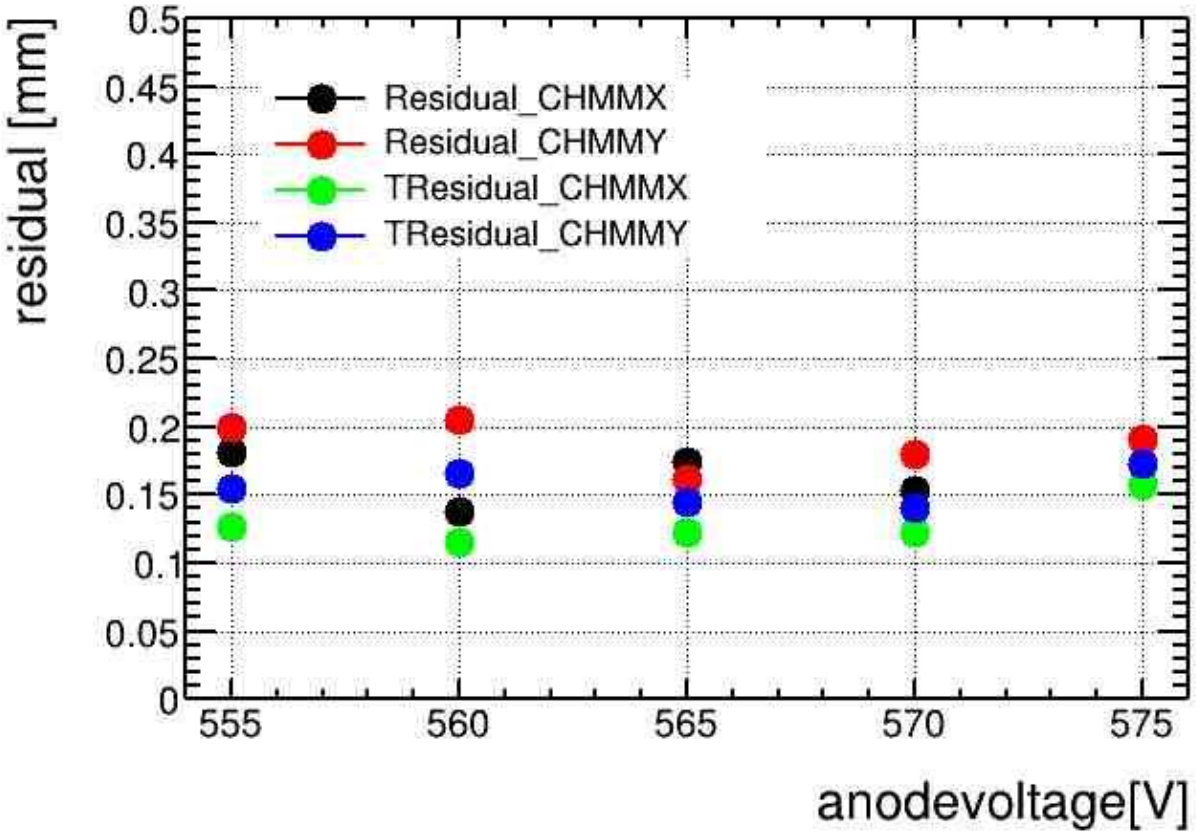
Core residual



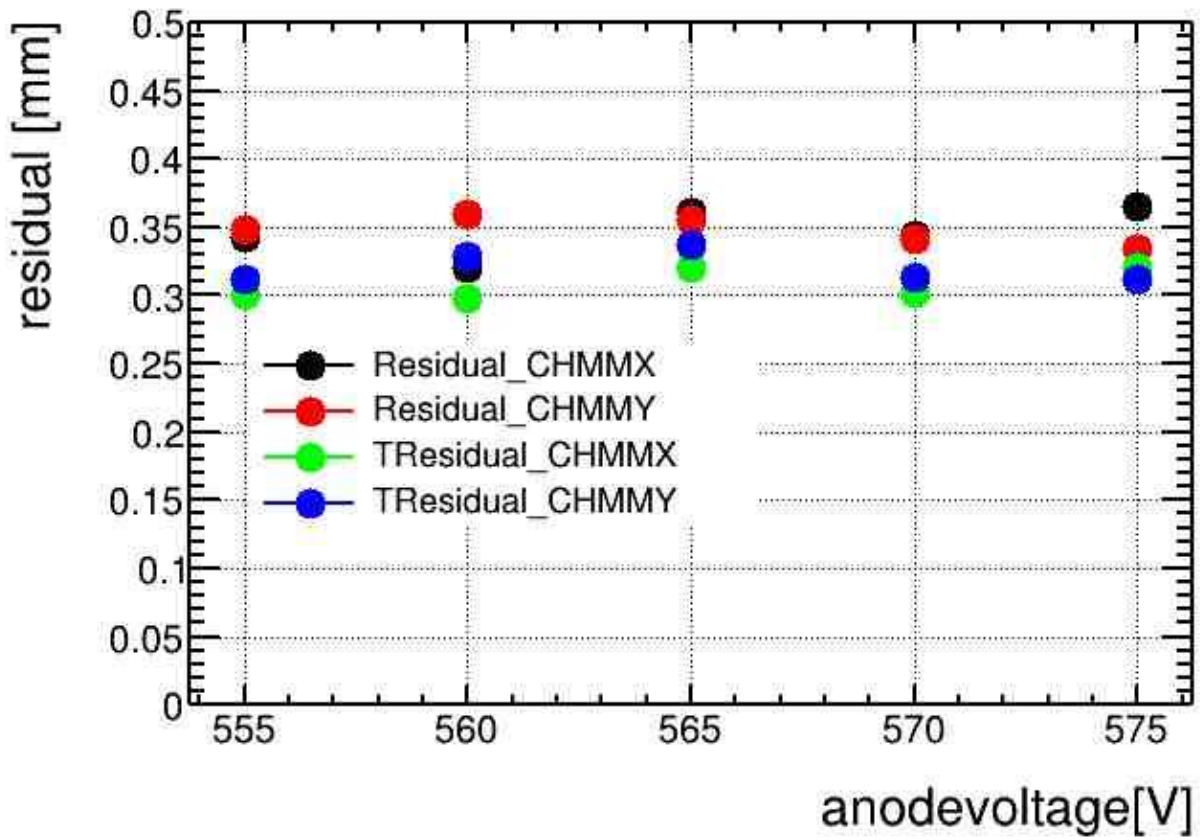
weighted residual

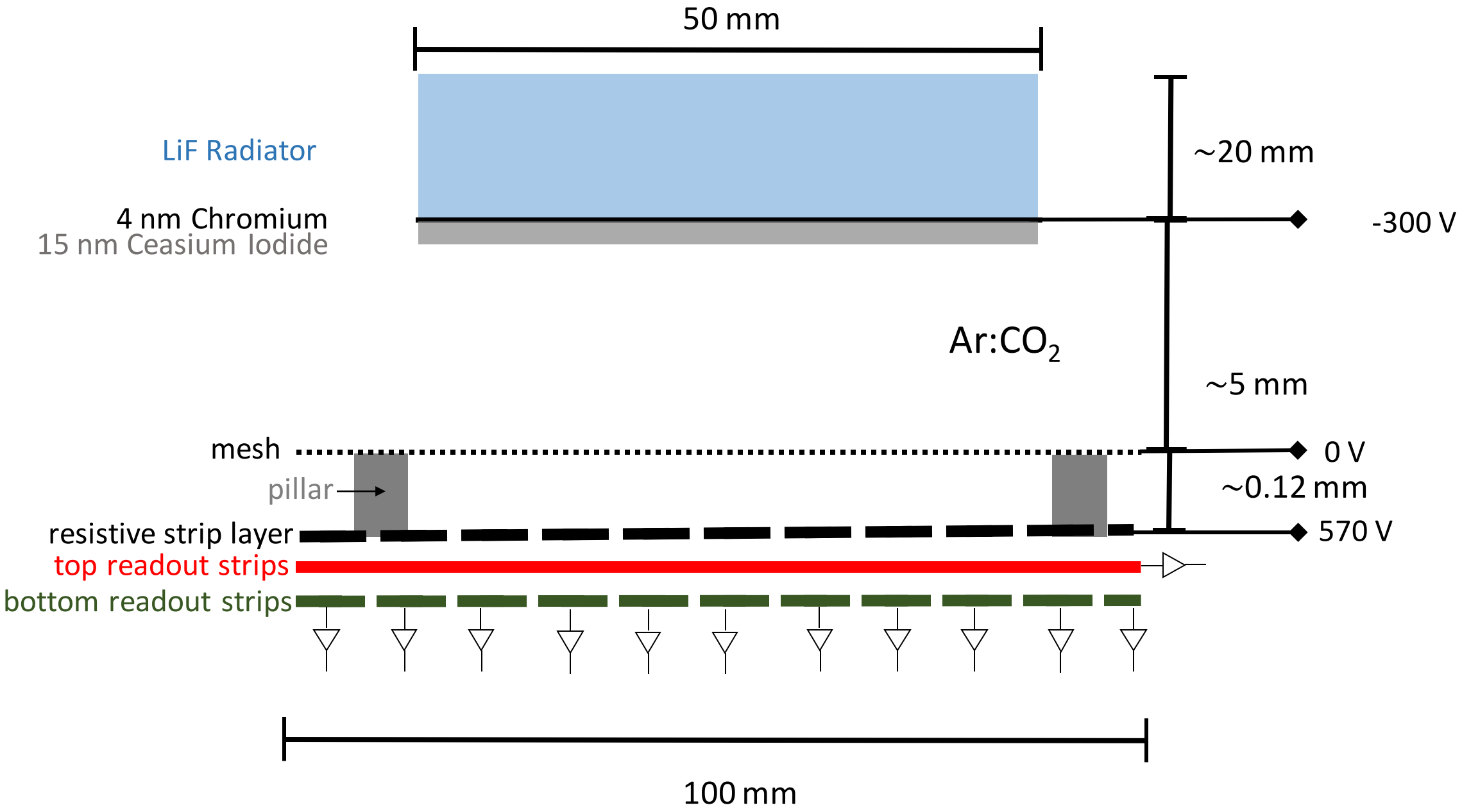


resolution core



resolution

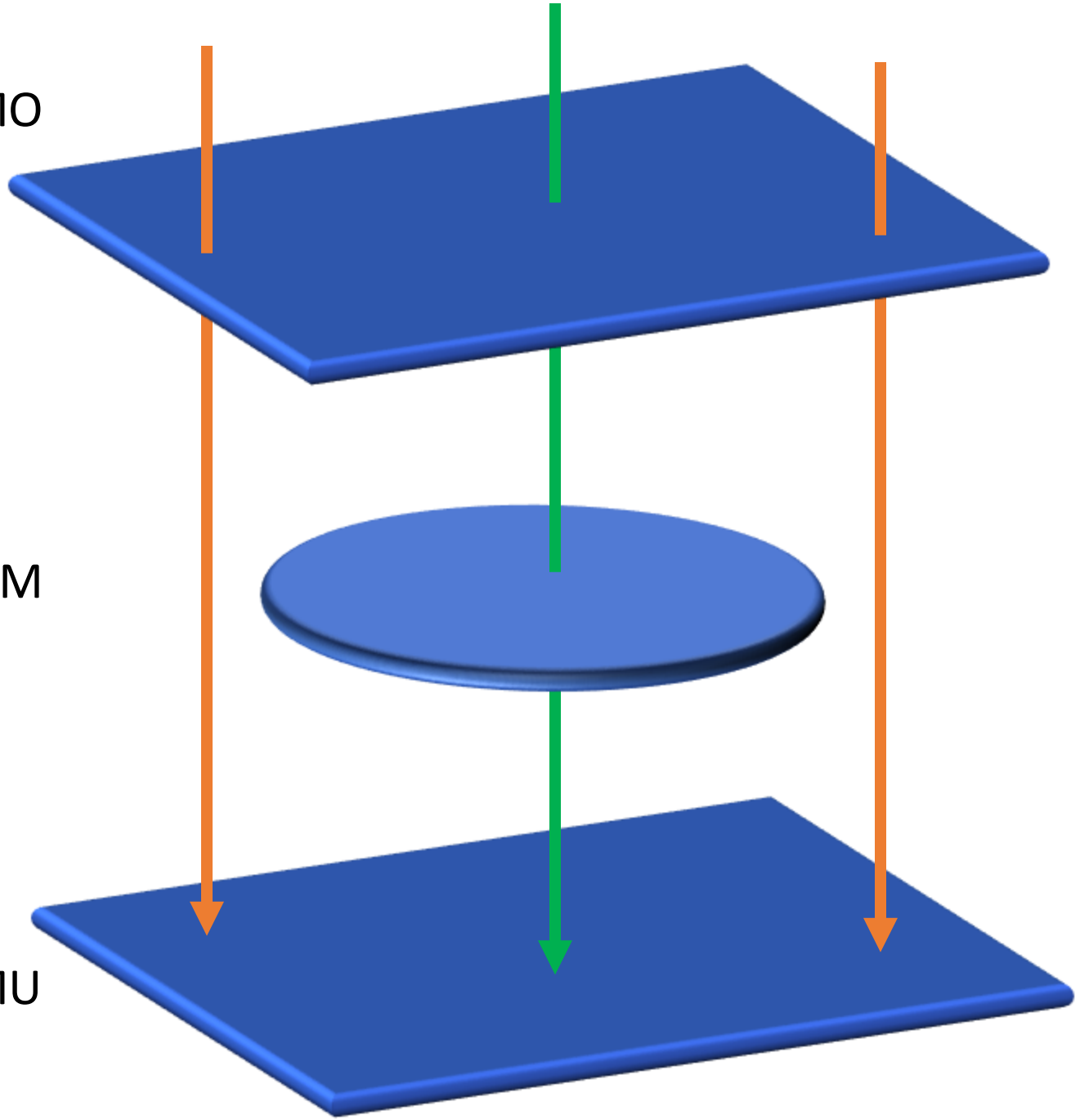



50 mm
LiF Radiator
4 nm Chromium
15 nm Ceasium Iodide
~20 mm
-300 V
Ar:CO2
~5 mm
mesh
0 V
pillar
~0.12 mm
resistive strip layer
570 V
top readout strips
bottom readout strips
100 mm

active area TMMO

active area CHMM

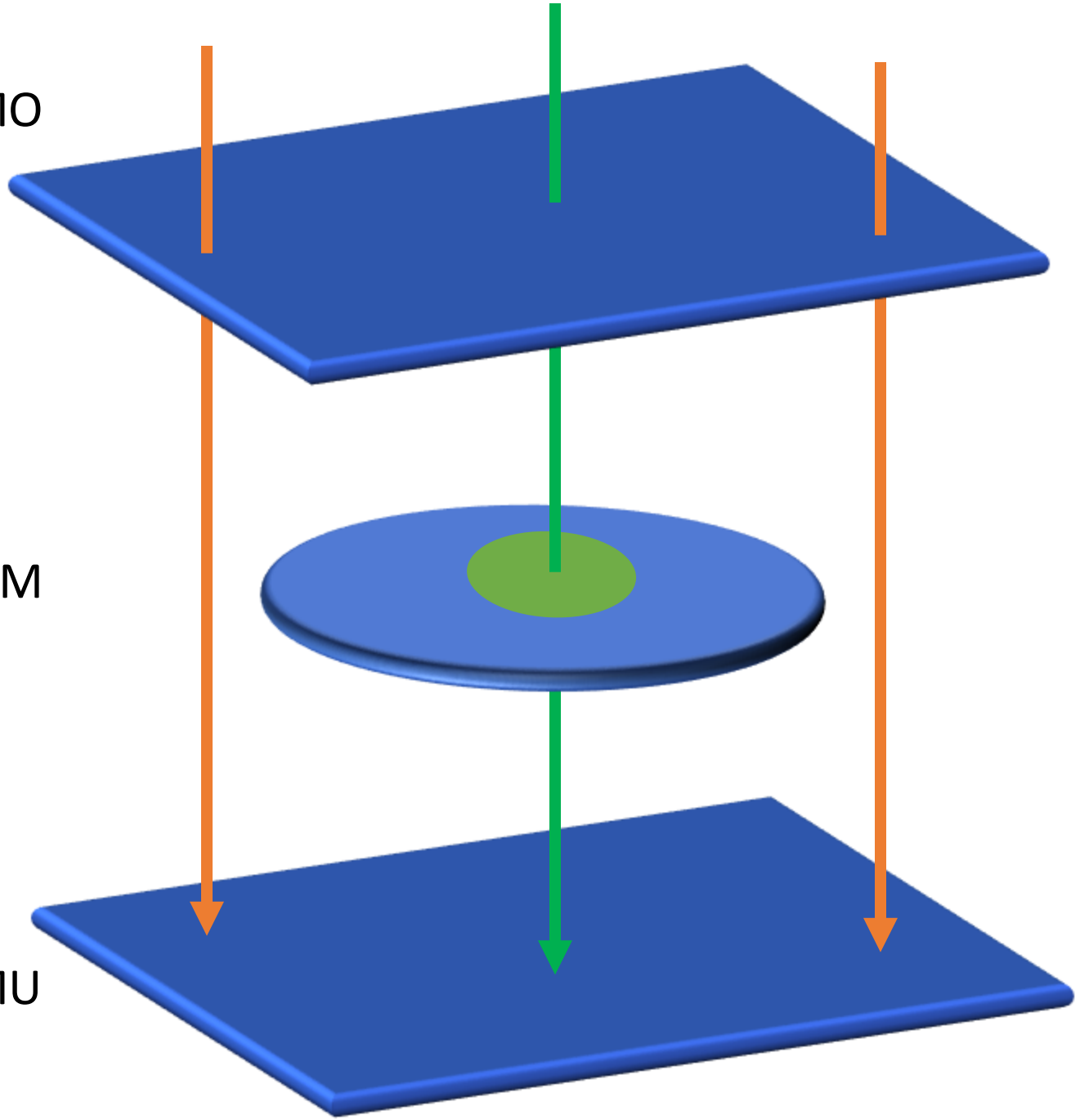
active area TMMU



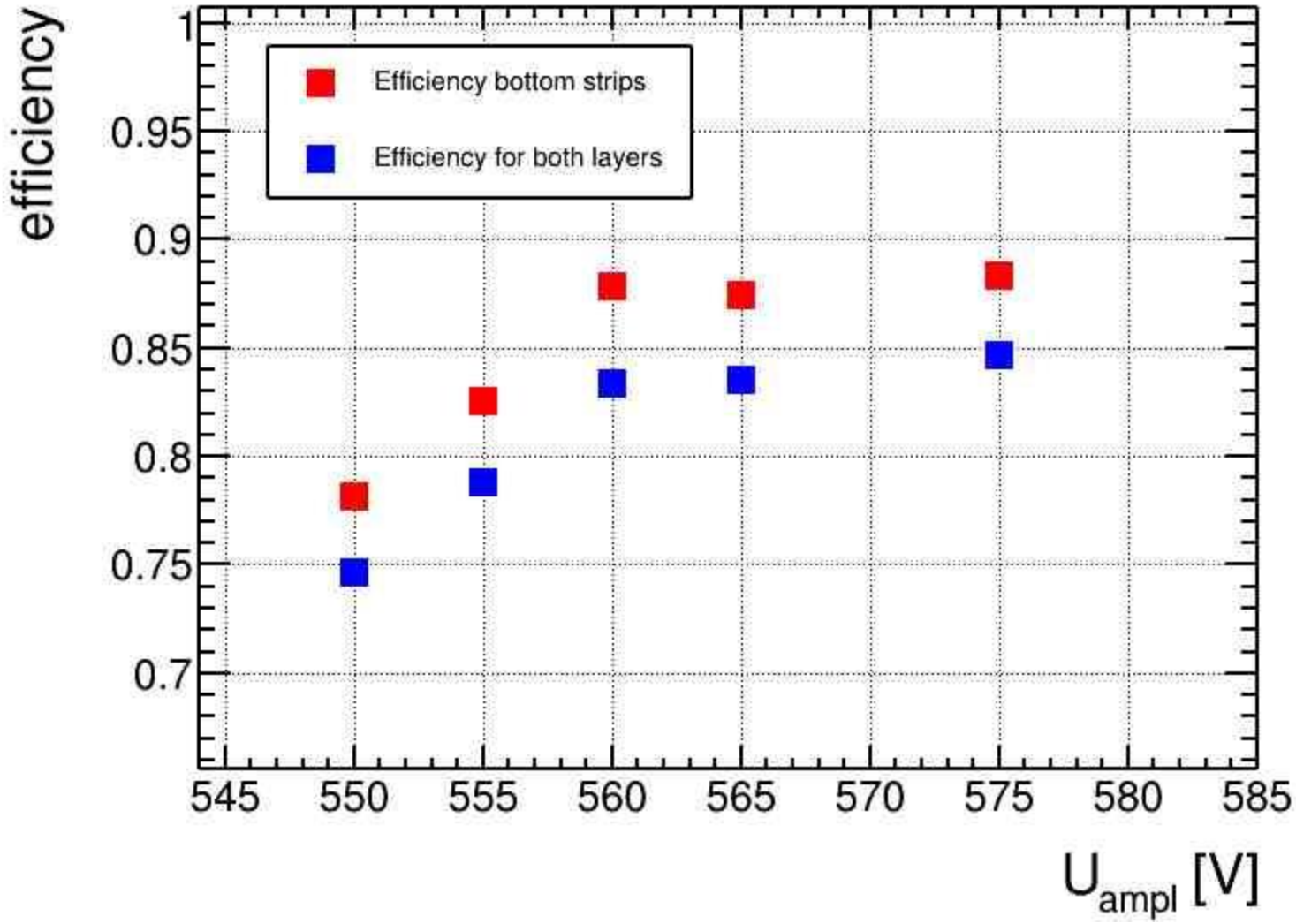
active area TMMO

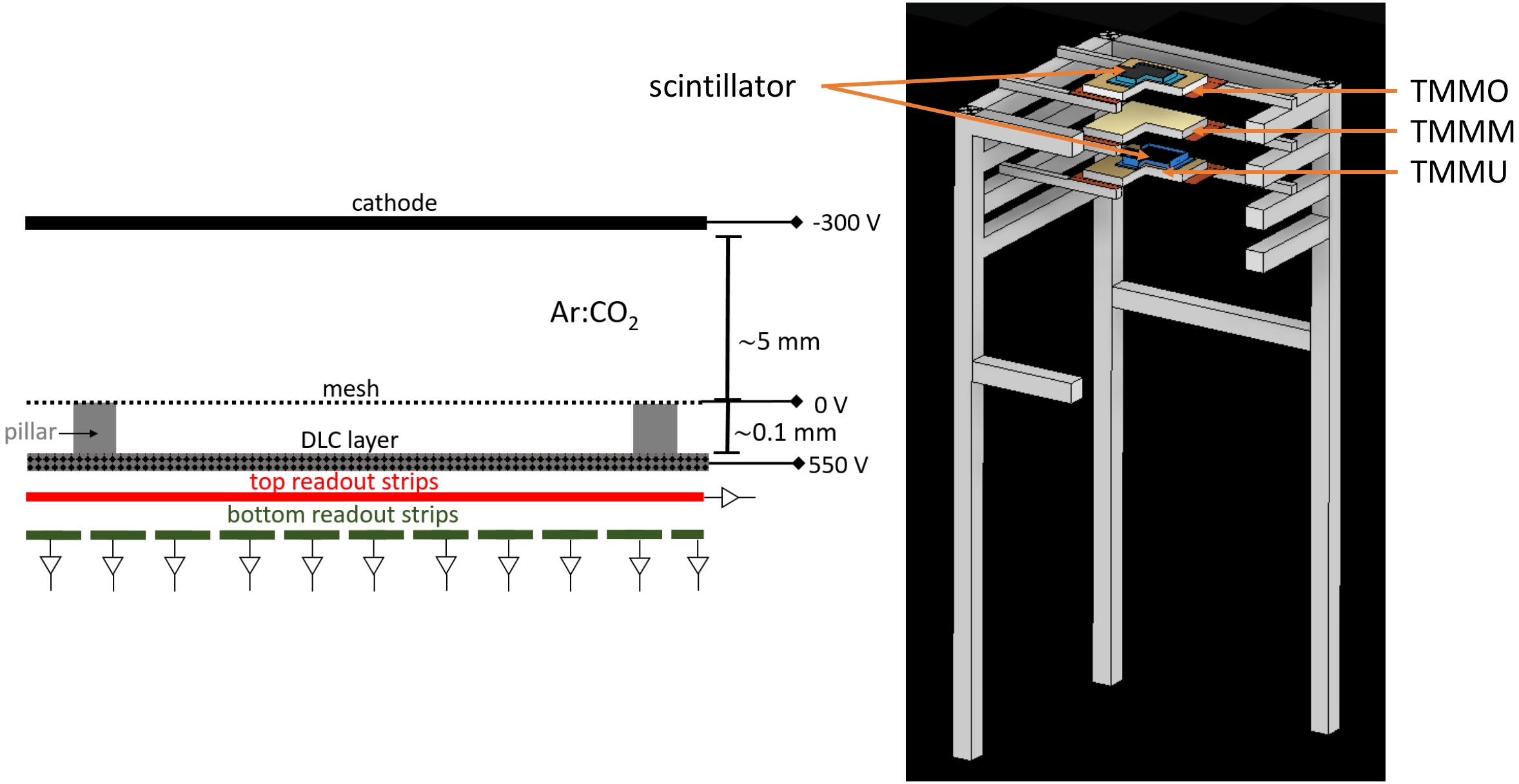
active area CHMM

active area TMMU



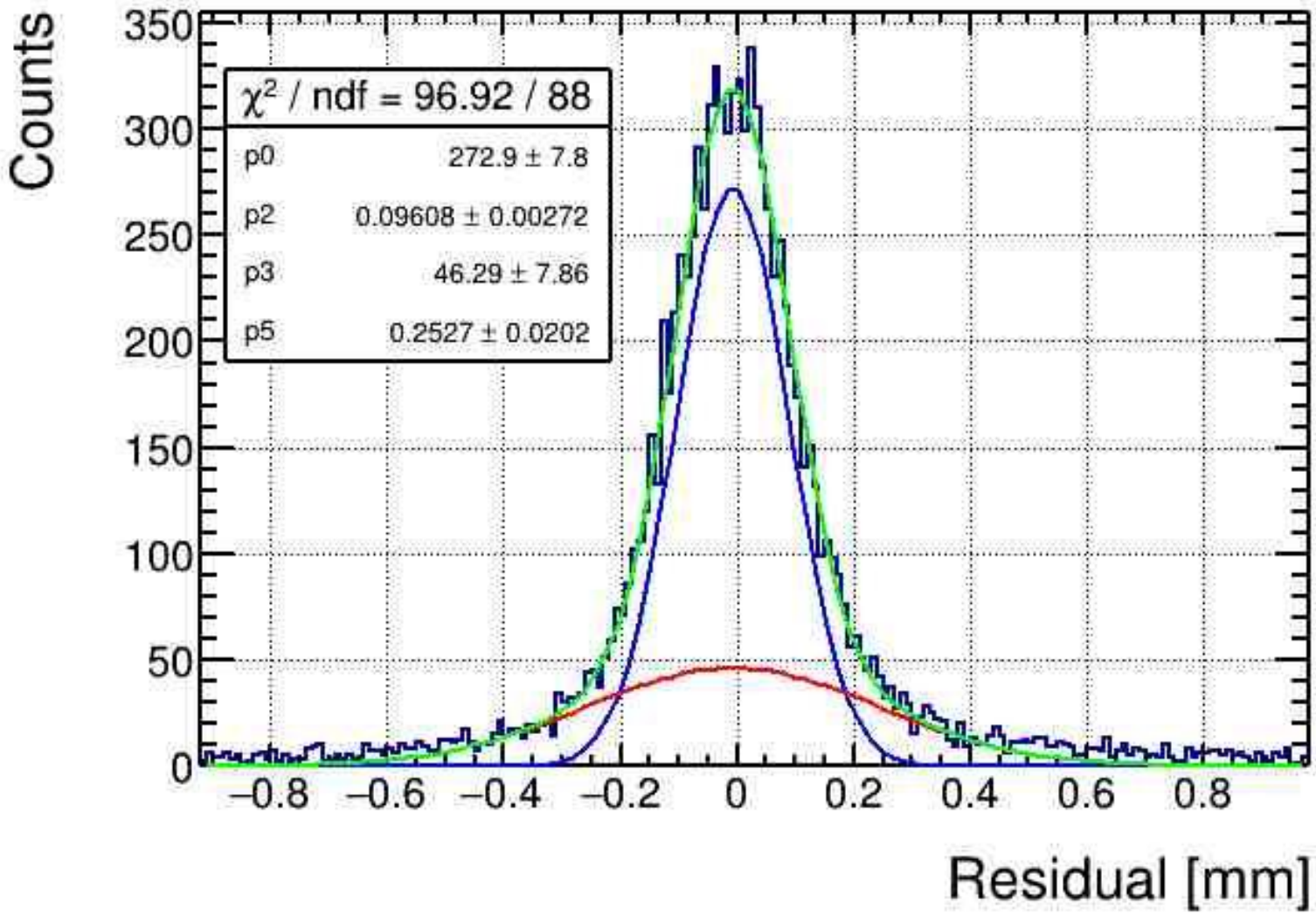
3mm efficiency in the center of the detector




scintillator
TMMO
TMMM
TMMU
cathode
-300 V
Ar:CO2
~5 mm
mesh
0 V
pillar
DLC layer
~0.1 mm
550 V
top readout strips
bottom readout strips

top strip resolution with the time corrected method:

σ_{core} = 75 μm, $\sigma_{weighted}$ = 128 μm



3mm top strip efficiency : 0.92

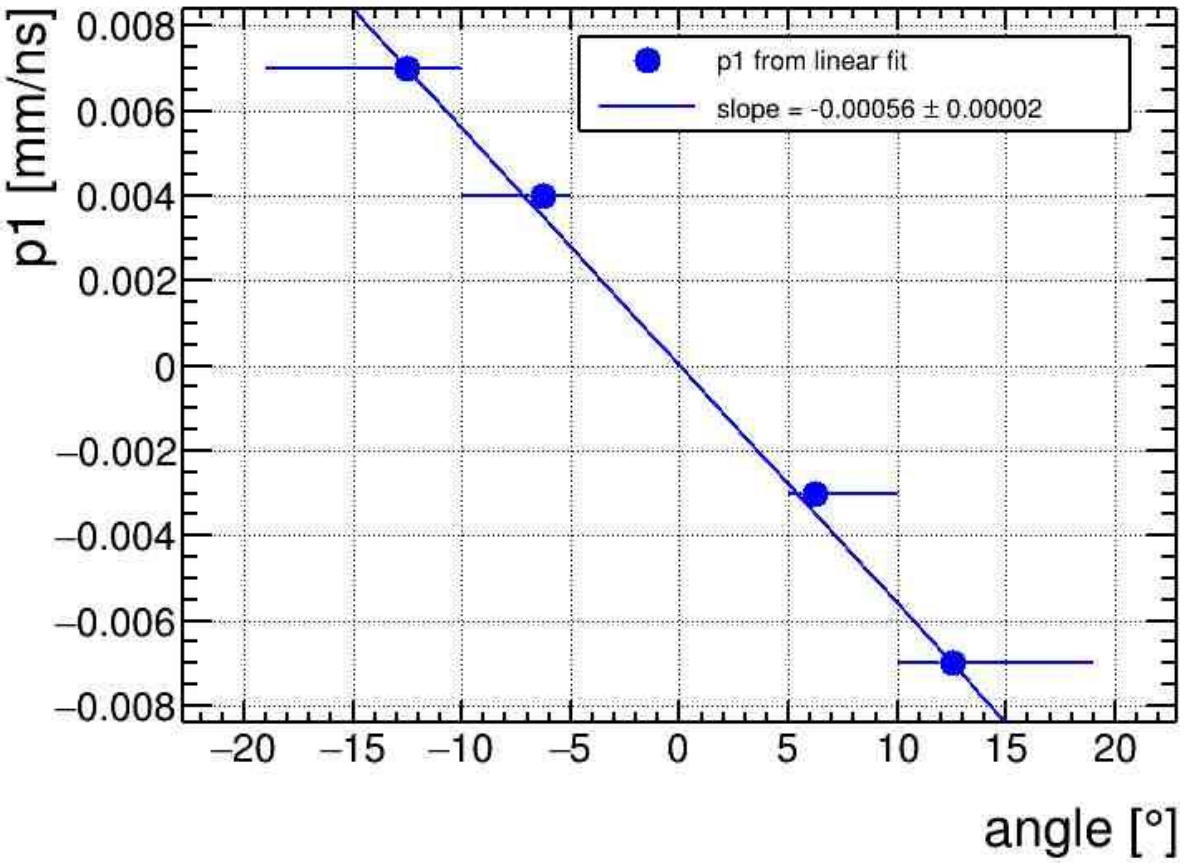
3mm 2D efficiency : 0.88

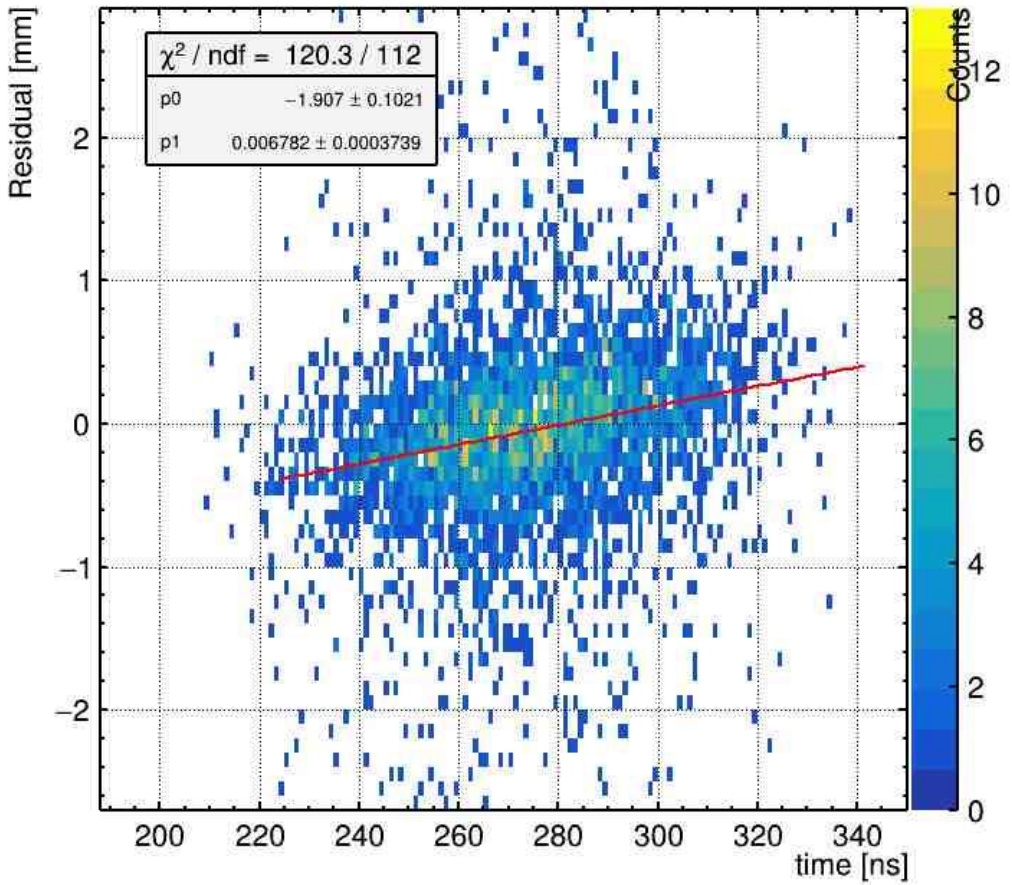
theory : $\Delta x = (t_{mid} - t_{coc}) \cdot v_D \cdot \tan(\theta)$

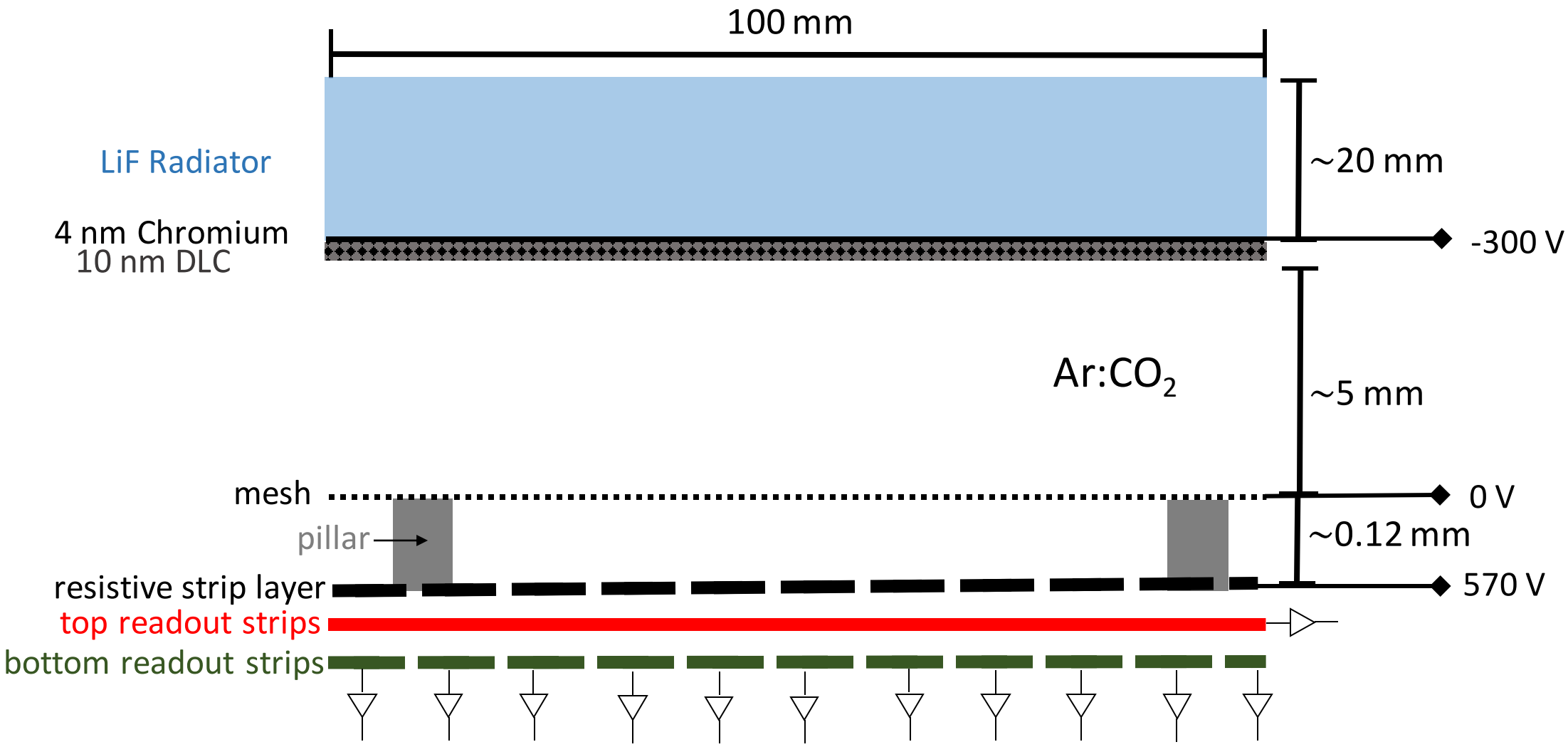
$\Delta x = (t_{mid} - t_{coc}) \cdot \text{slope} \cdot \theta$

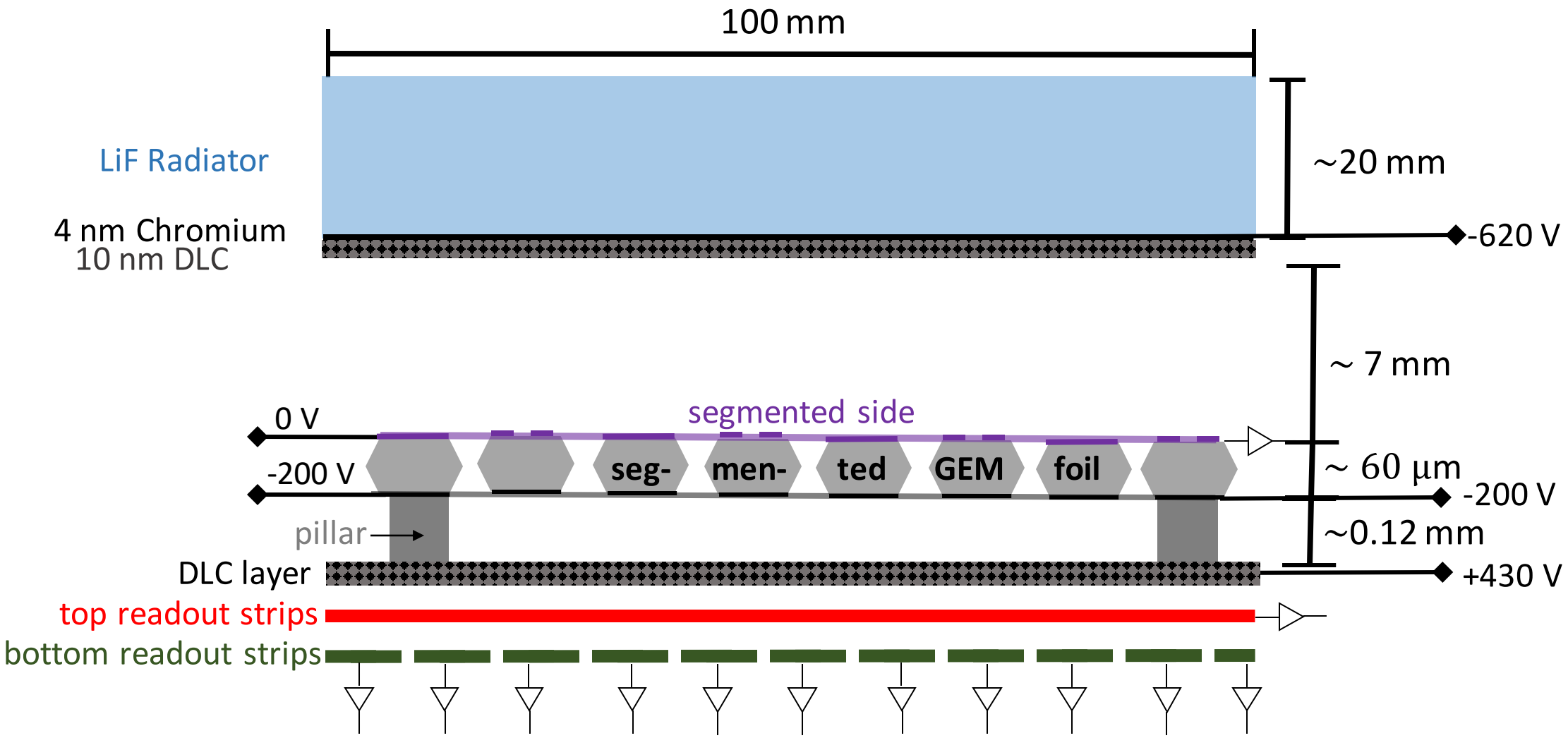
$$t_{coc.} = \frac{\Sigma\, q_i\, t_i}{\Sigma\, q_i}$$

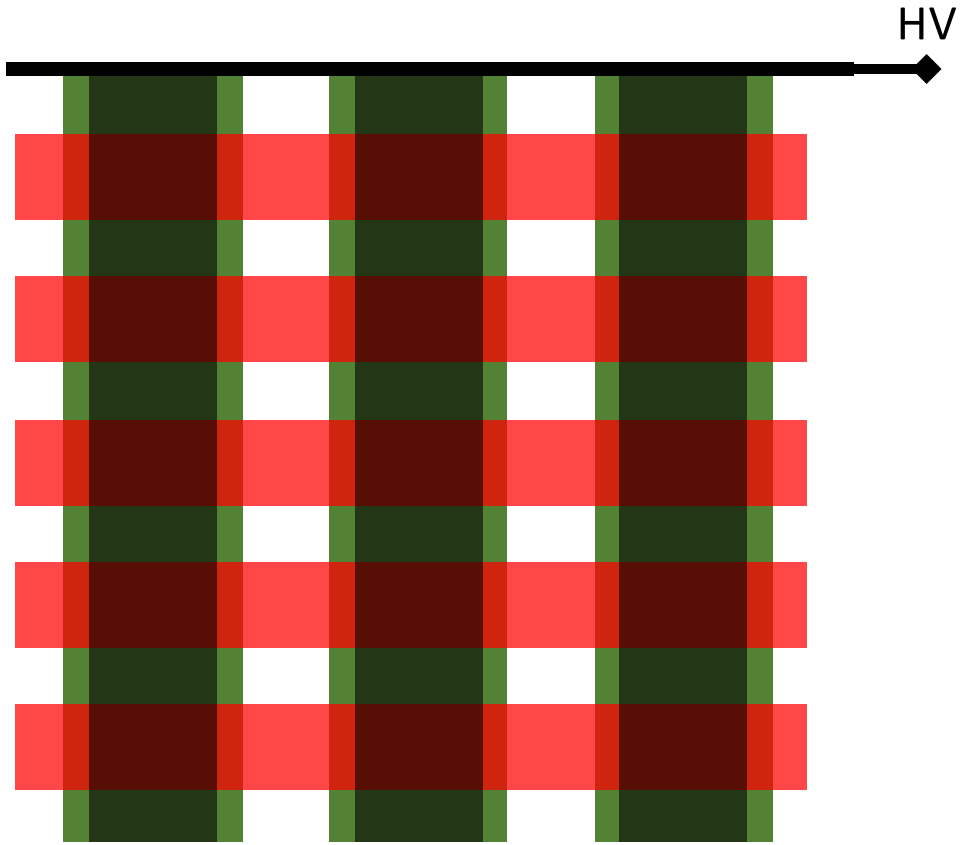
now: slope = - 0.0008 ?

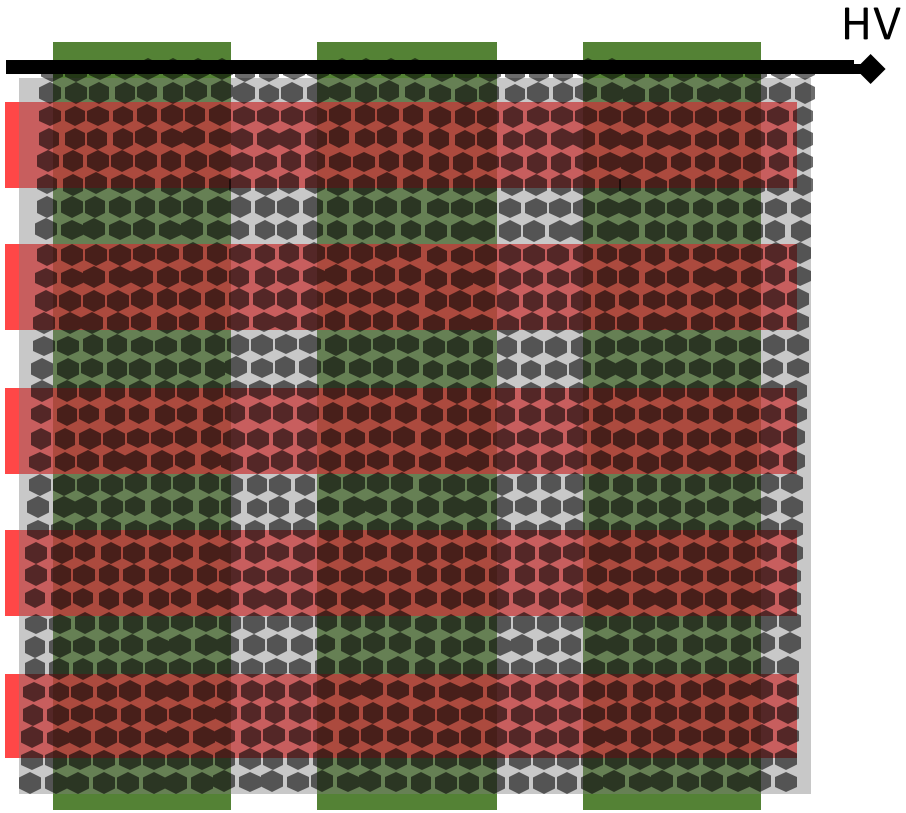





100 mm
LiF Radiator
4 nm Chromium
10 nm DLC
~20 mm
-300 V
Ar:CO2
~5 mm
mesh
0 V
pillar
~0.12 mm
resistive strip layer
570 V
top readout strips
bottom readout strips


100 mm
LiF Radiator
4 nm Chromium
10 nm DLC
~20 mm
-620 V
~ 7 mm
segmented side
0 V
-200 V
seg-
men-
ted
GEM
foil
~ 60 µm
-200 V
pillar
~0.12 mm
DLC layer
+430 V
top readout strips
bottom readout strips


HV


HV