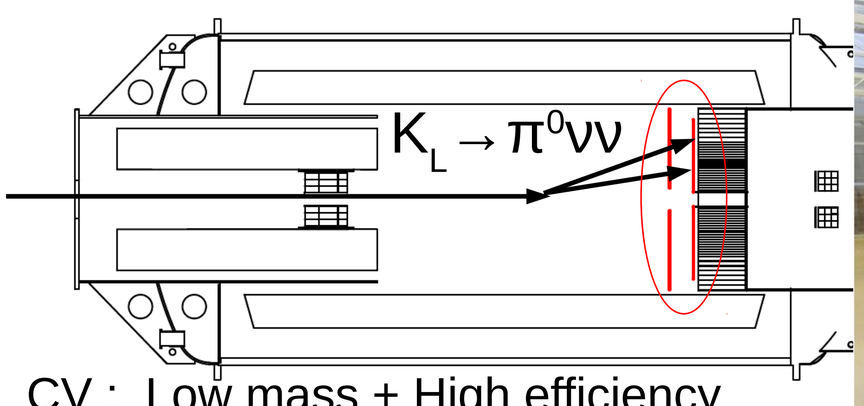
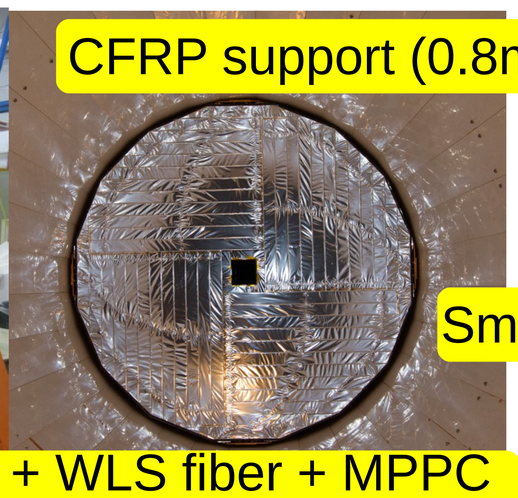
Charged-Particle Veto Detector for the KOTO Experiment

H. Nanjo (Osaka U.) and D. Naito (Kyoto U.) for the KOTO collaboration



CV : Low mass + High efficiency

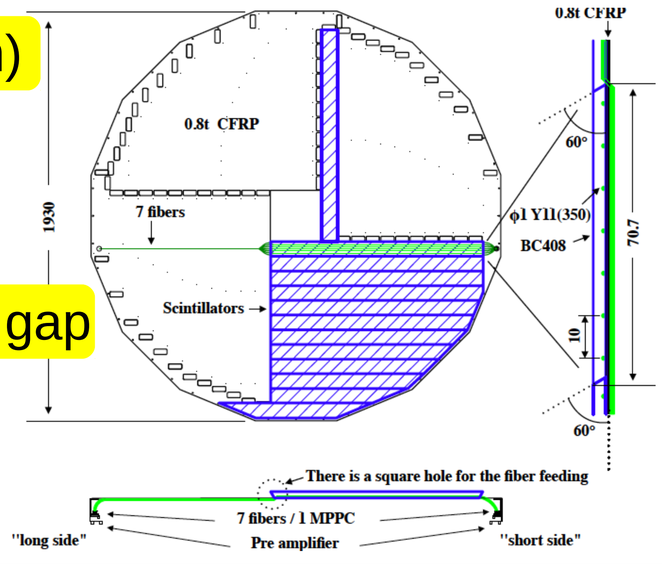
Two layers x 0.45g/cm^2



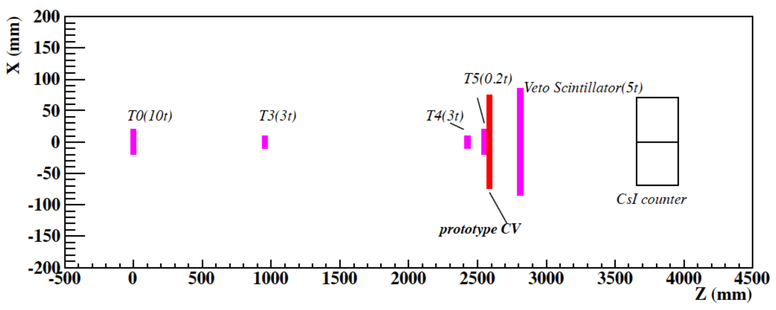
CFRP support (0.8mm)

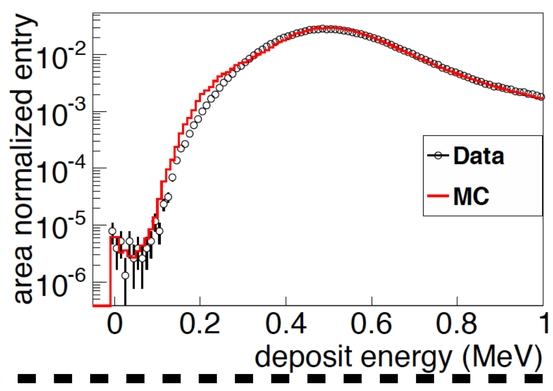
Small gap

Plastic scinti.(3mm) + WLS fiber + MPPC
wrapped with aluminized PET (12μm)



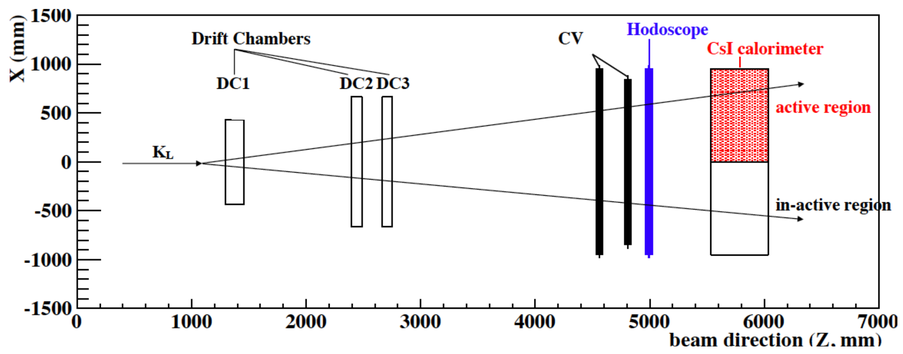
Performance test with positron (Prototype)

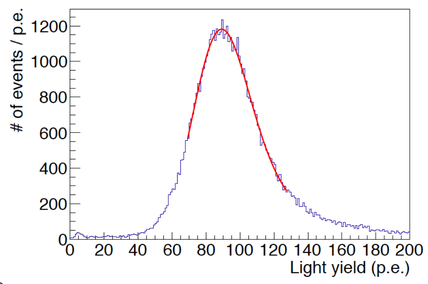




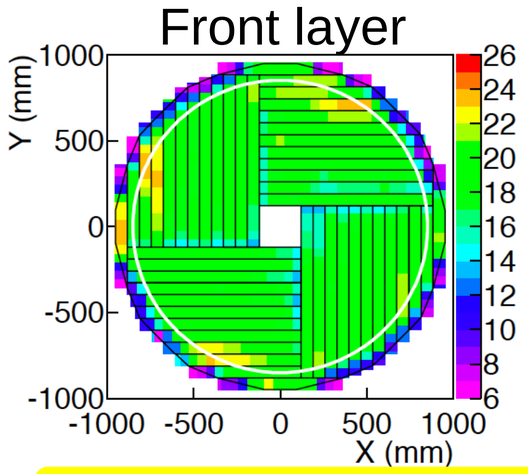
Annihilation inefficiency
Data : 4.5±0.8 x 10^{-5}
MC : 4.0±0.1 x 10^{-5}

Performance test with K_L decay (actual CV)

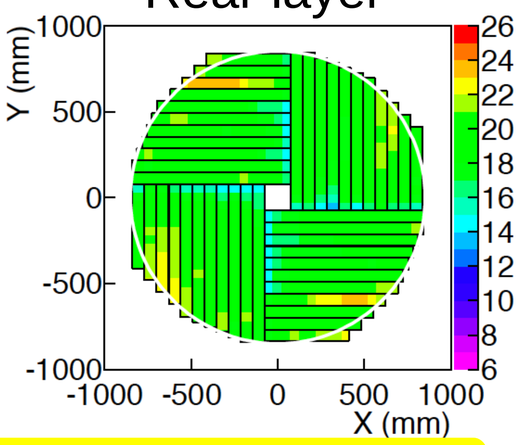




Front layer

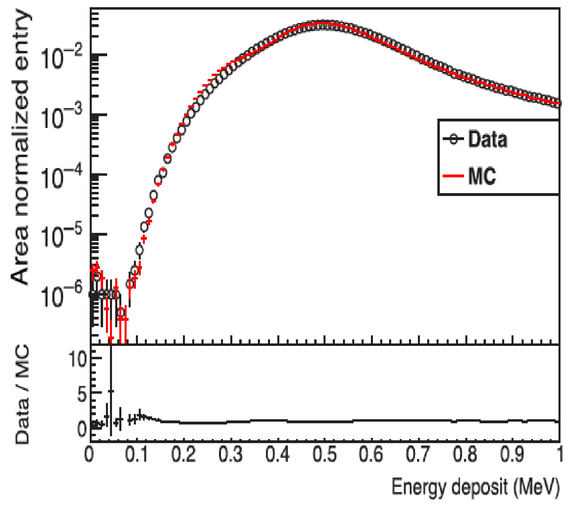


Rear layer



Light Yield (p.e./100 keV)

Average: 18.6 p.e./ 100 keV = 87 p.e / MIP



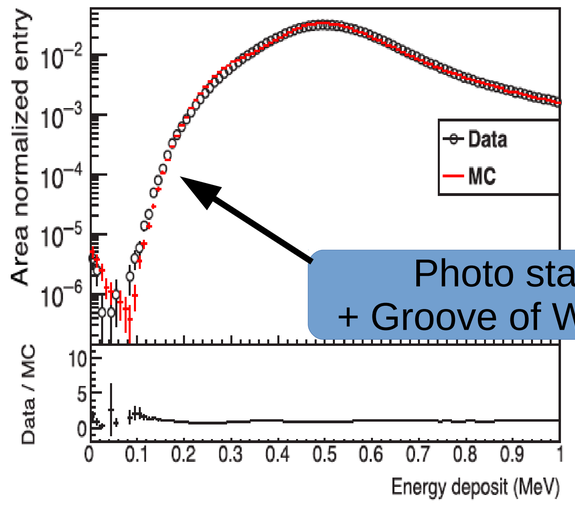
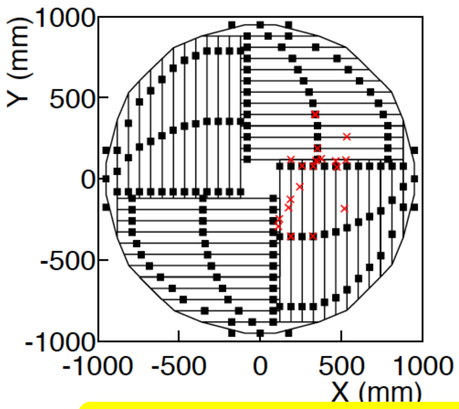
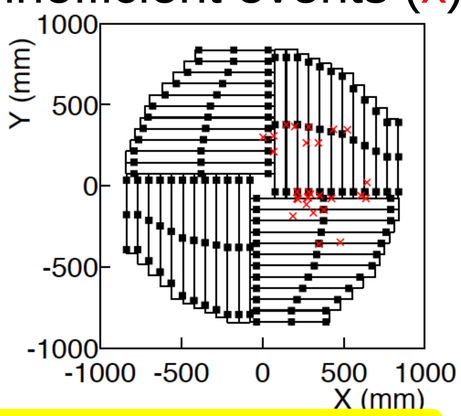


Photo statics
+ Groove of WLS fiber

Penetrating inefficiency for single layer
Data : < 1.5 x 10^{-5} (90% C.L.) MC: well reproduced

Position of inefficient events (x)

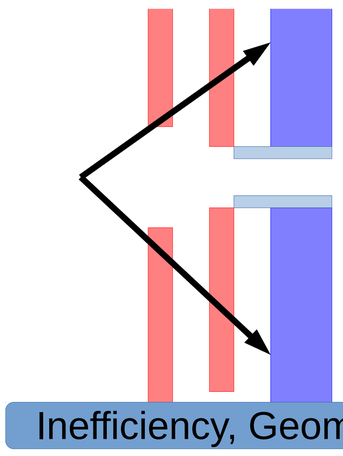




Cause of inefficiency: Cut outs / Edge

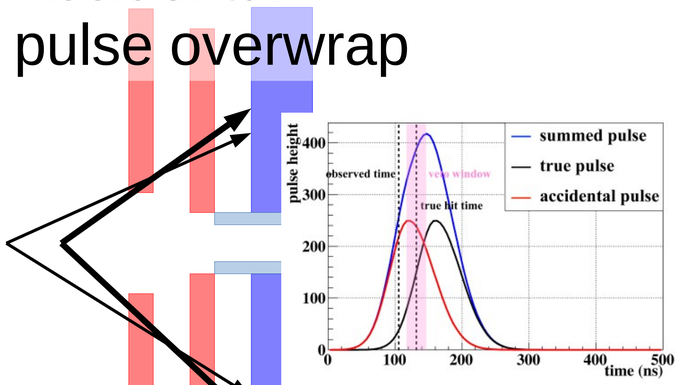
Various backgrounds

Penetrating Ke3



Inefficiency, Geometry

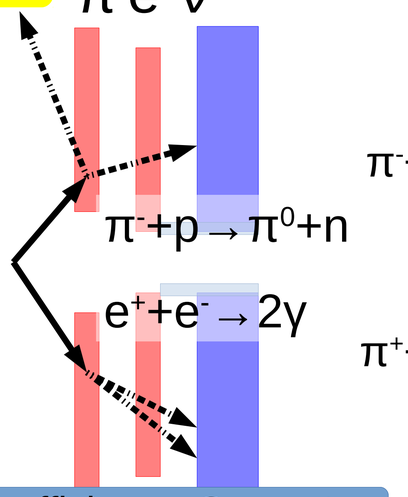
Accidental pulse overwrap



Timing miss-measurement

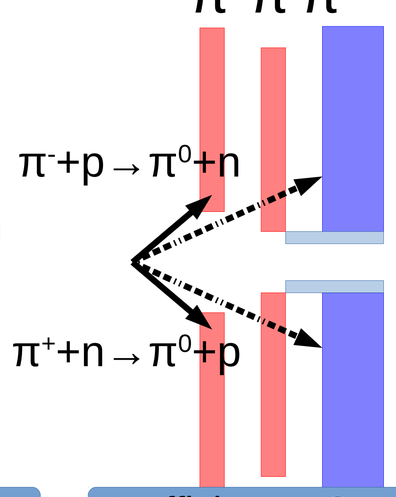
Geometry, Rate,Waveform analysis

$\pi^-e^+\nu$



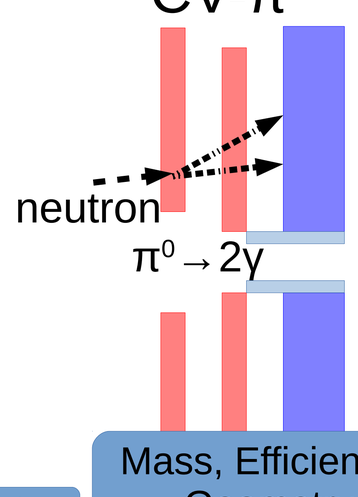
Inefficiency, Geometry

$\pi^+\pi^-\pi^0$



Inefficiency, Geometry

CV-π^0



Mass, Efficiency, Geometry

B/S(SM)=negligible	0.25 To be updated	0.03 To be updated	0.04 To be updated	0.03 To be updated

Charged Veto at KOTO
- Low mass ⇔ neutron
- High efficiency ⇔ Ke3/$\pi^+\pi^-\pi^0$
  - High light yield
  - Small gap
  - Small dead material in front

Final Pt-Z vertex plot