Update on the

Disc DIRC

conceptual design

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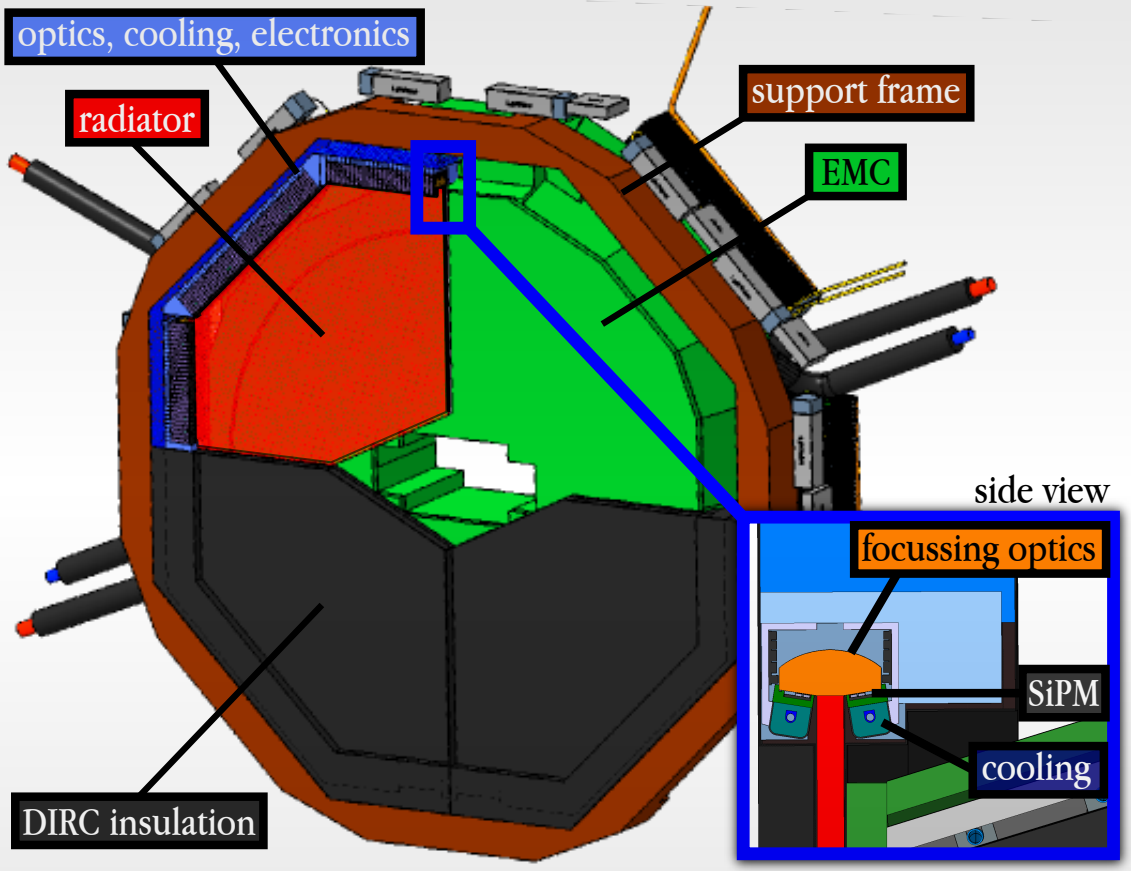
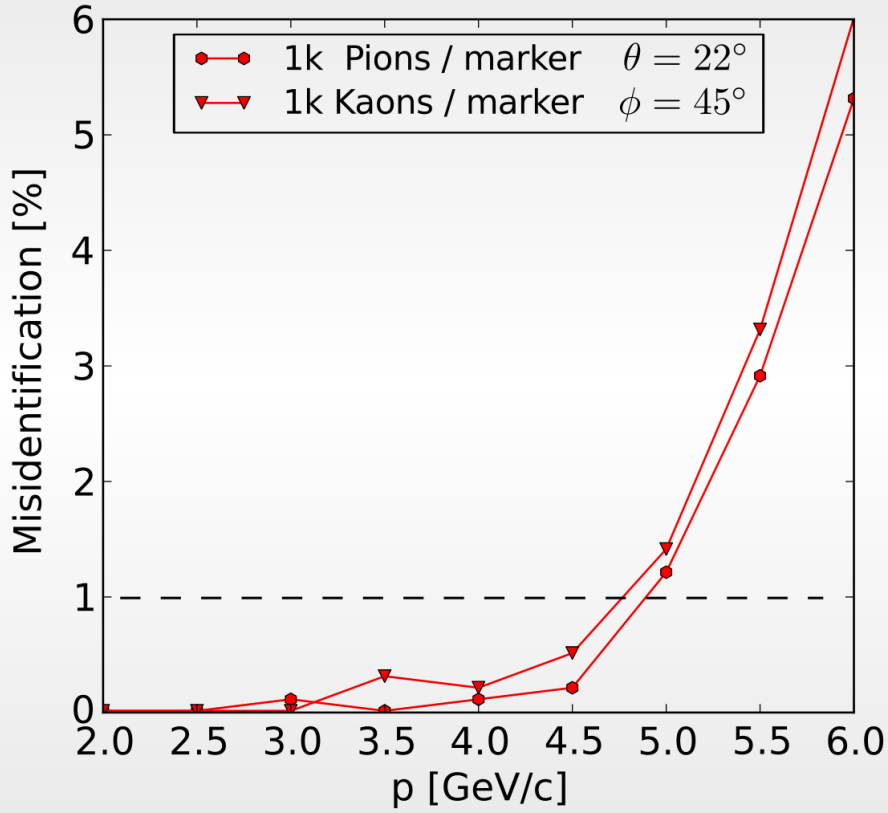
PANDA Collaboration Meeting 06/2013

dSiPM based "3D Disc DIRC"

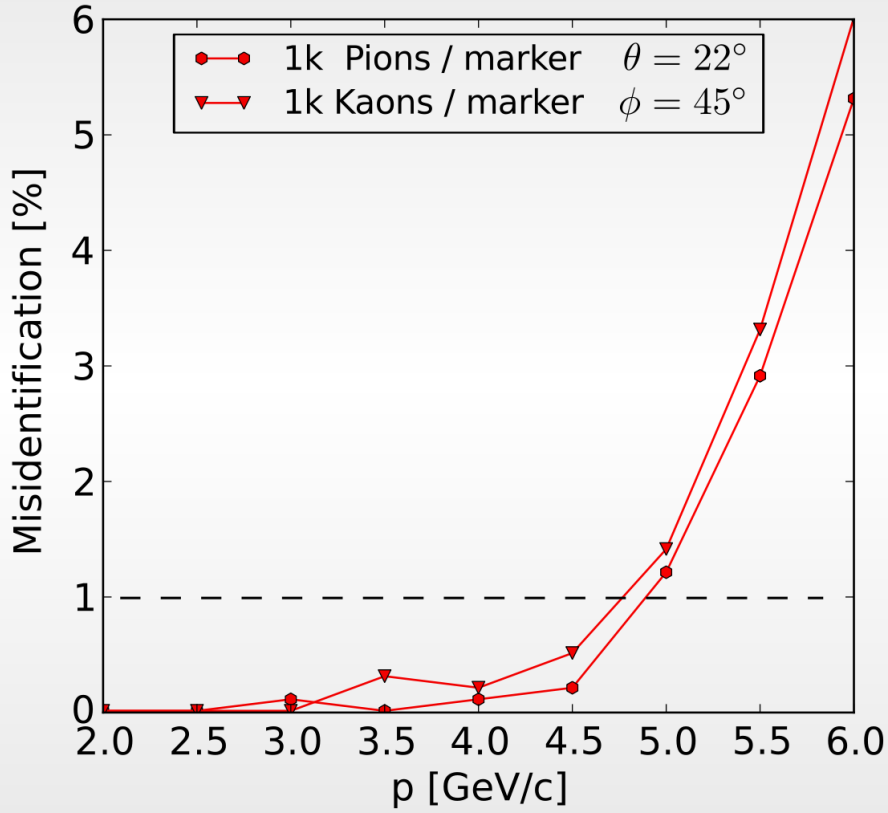




dSiPM based "3D Disc DIRC"

Good separation

(for a few PANDA days)



What did we accomplish ?

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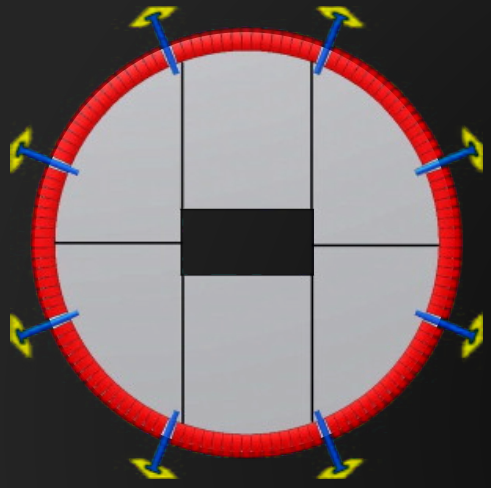
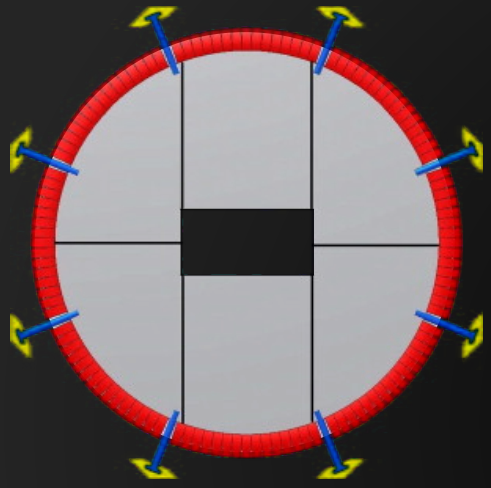


10.1016/j.nima.2010.09.132

- high modularization
- monolithic radiators

What did we accomplish ?



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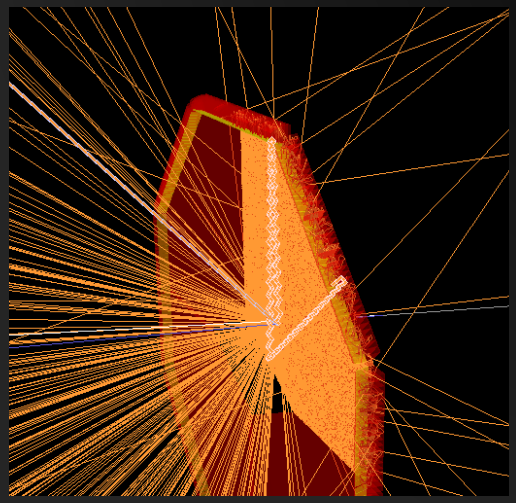


- **high modularization**
- **monolithic radiators**

- **pattern reconstruction**
  (for standalone & PROOT simulations)
- **PID on top of PANDA background**
  ("time based sim" @ 10 MHz / 15 GeV/c)

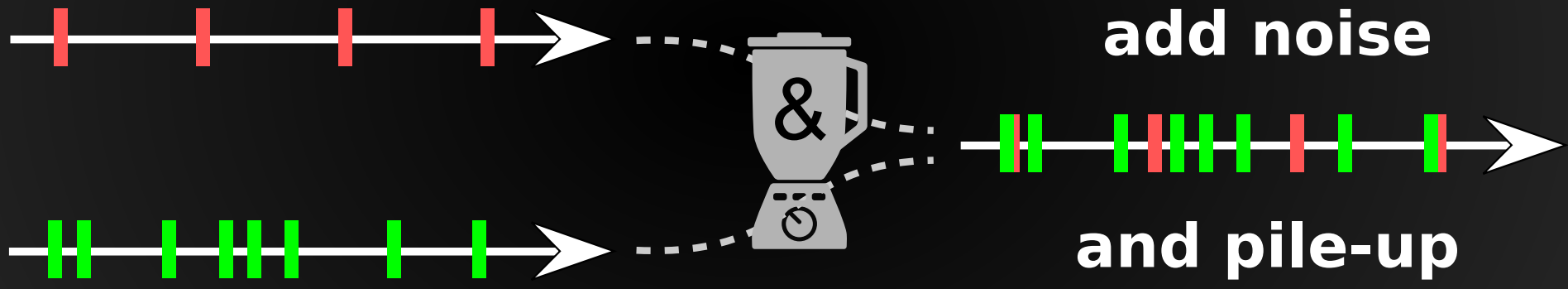
PID with DPM background

- **simulation in PandaROOT**
  (material budget, magnetic field, ...)
- **"time based" simulation**
  (pile-up across event boundaries)
- **event mixing**
  (mix signal/probe tracks with DPM)
- **systematic study**
  (1k equal probe tracks for each [θ,φ])

PID with DPM background

1k equal probe tracks

ΔT evenly distributed in time



stream of DPM events

exponential distribution of ΔT

PID with DPM background

reconstruction of probe tracks

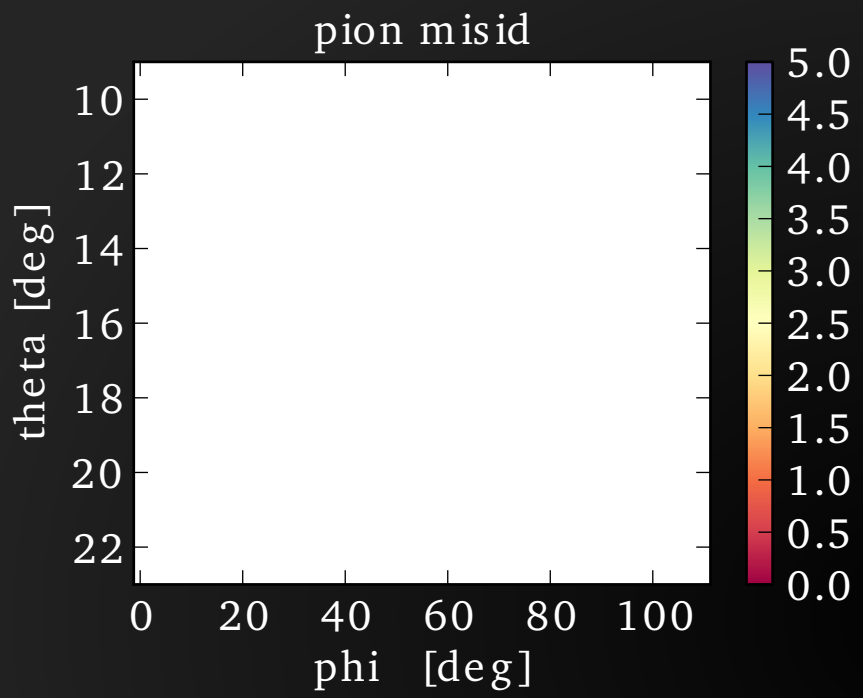
select hits in time window around track time

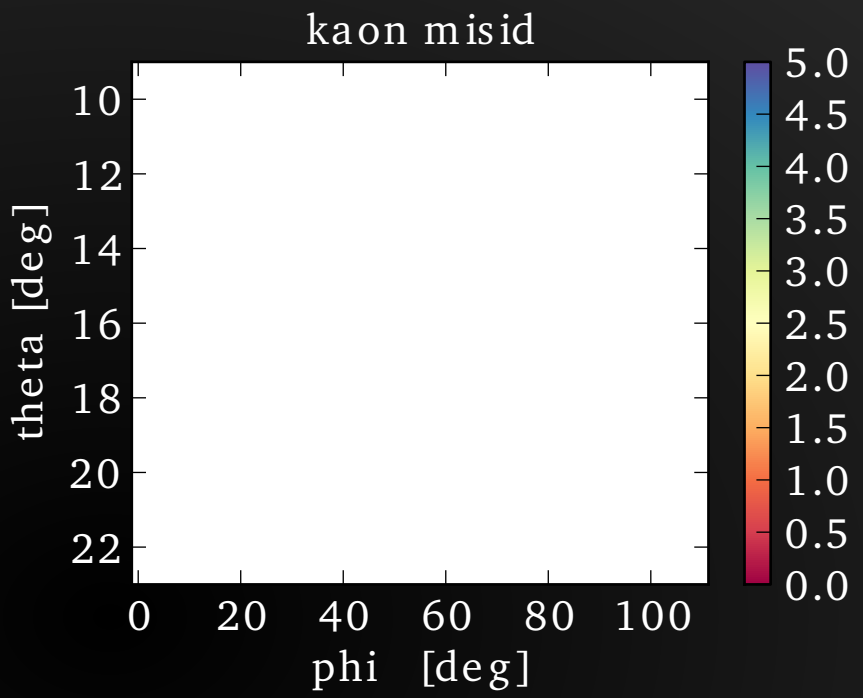
(-5 ns to +40 ns)

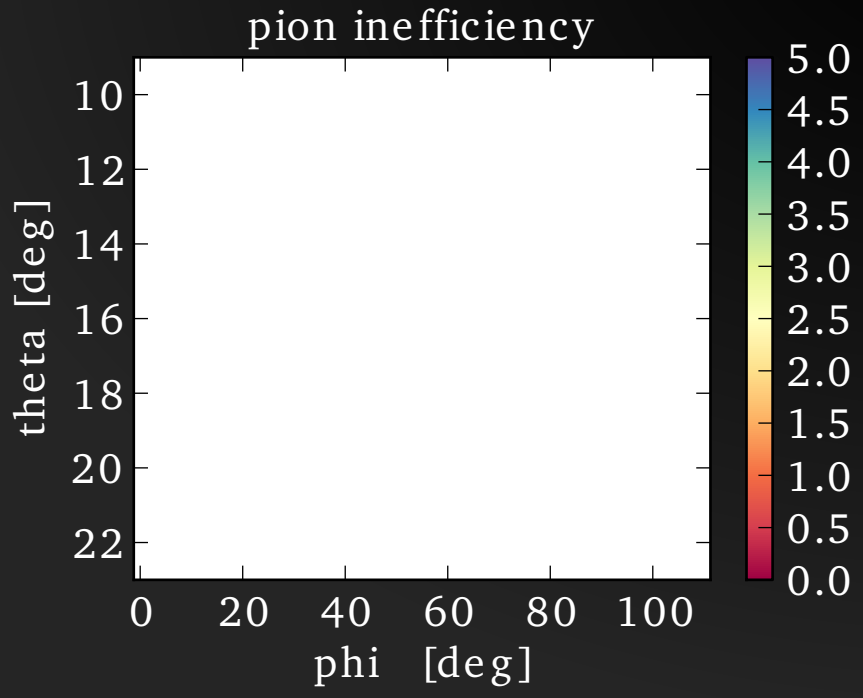
run "stock" reconstruction

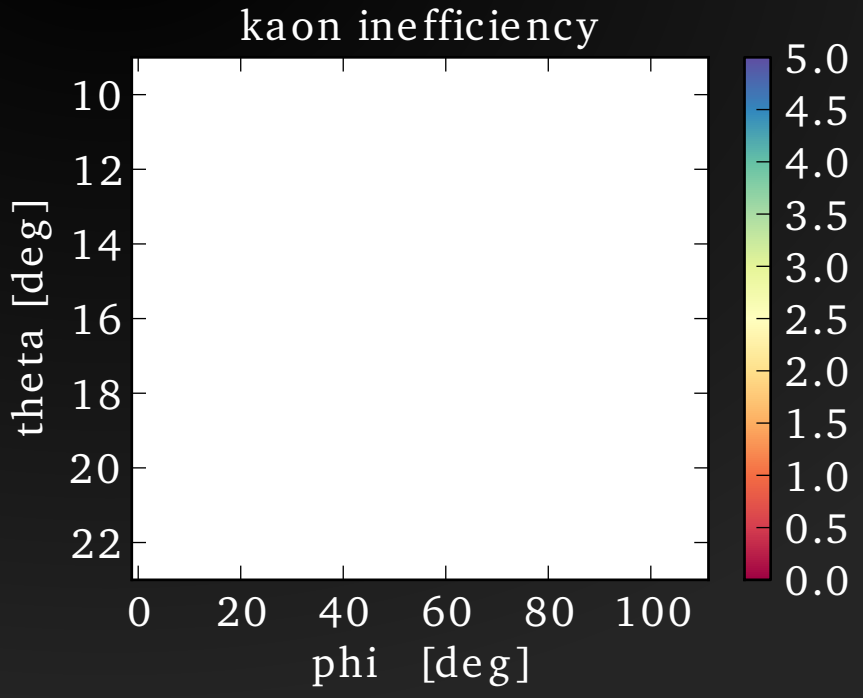
(determine T0 & likelihood for each hypothesis by comparing hits with on-the-fly computed pattern prediction)

PID with DPM background





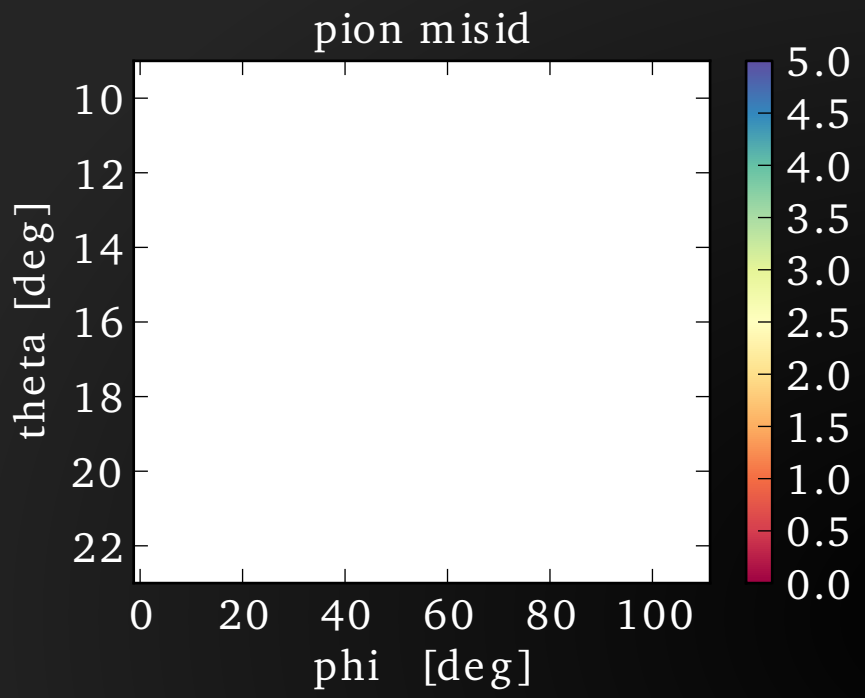


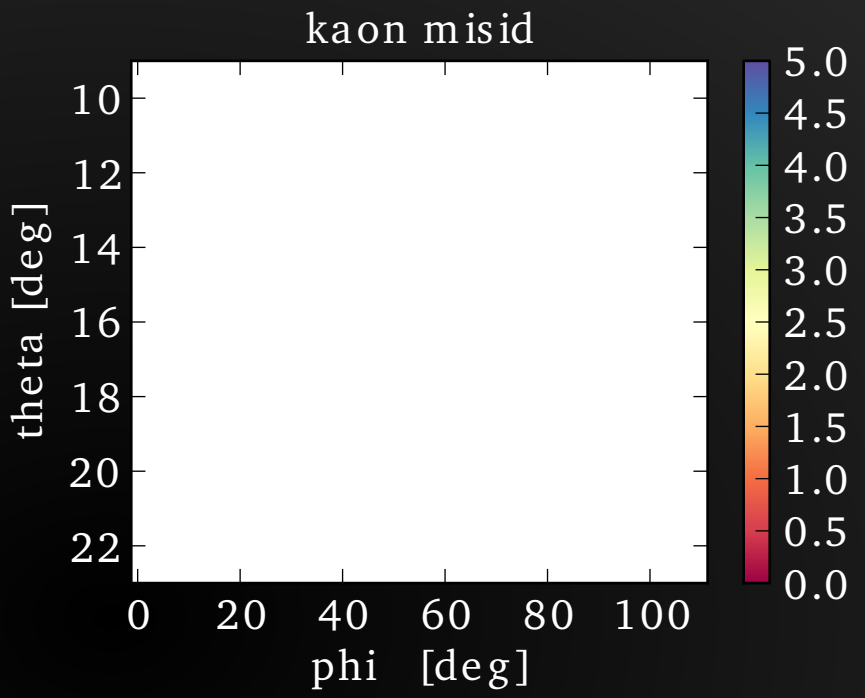


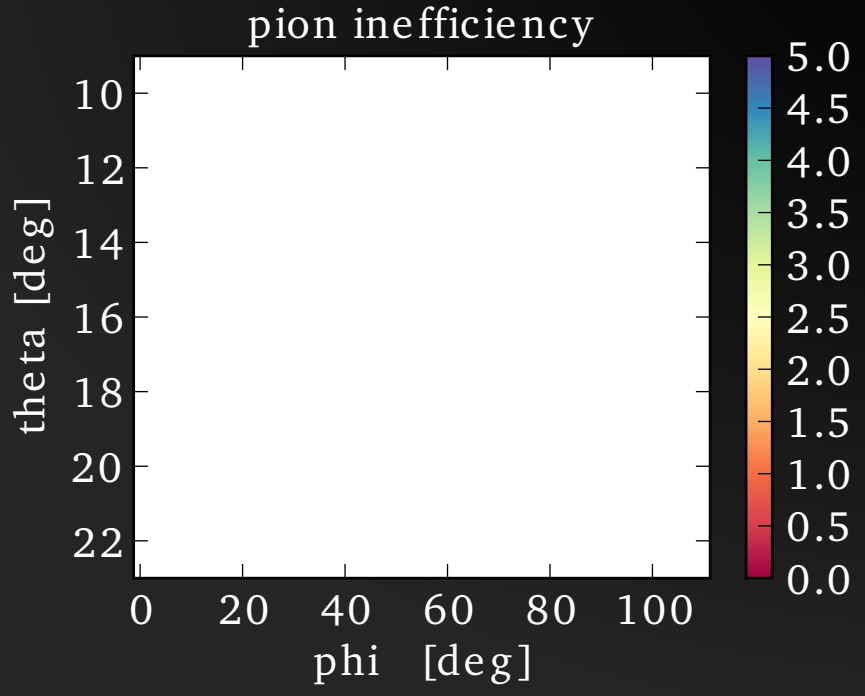
p =
4 GeV/c

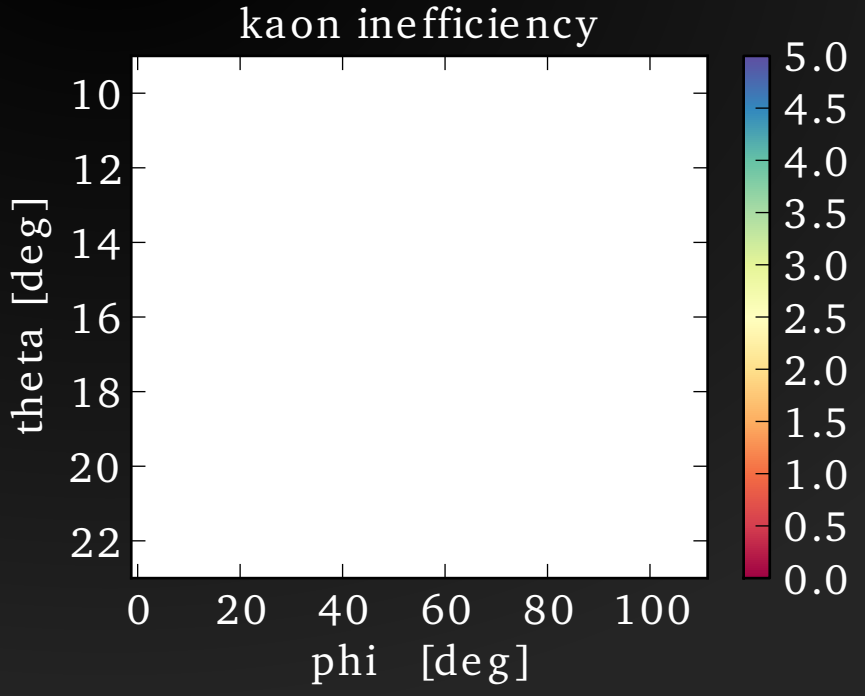
No tracking error

PID with DPM background







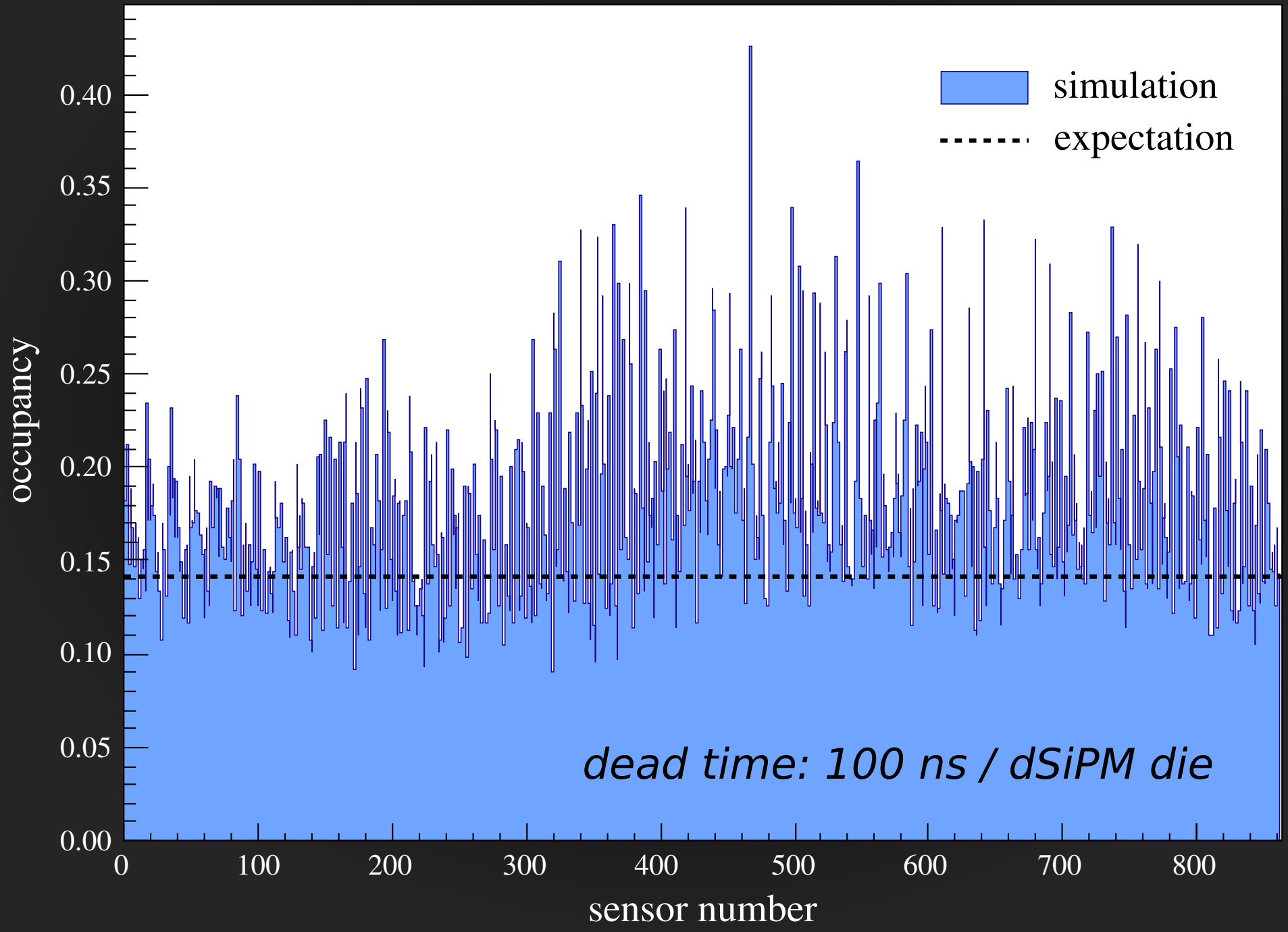


p = 4 GeV/c

$\sigma_{x,y}$ = 2.5 mm

$\sigma_{\theta,\varphi}$ = 1 mrad

PID with DPM background



Conclusions on PID study

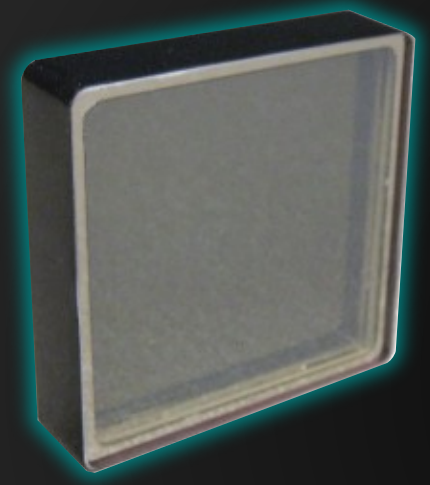
Reconstruction feasible at highest PANDA rates

Noise (here of dSiPMs) is not a major issue

Track extrapolation: need $\sigma_{\theta,\varphi} \sim 1$ mrad,
$\sigma_{x,y} \sim 2.5$ mm

... back to MCP-PMTs

MCP-PMTs are not perfect



Photonis Planacon

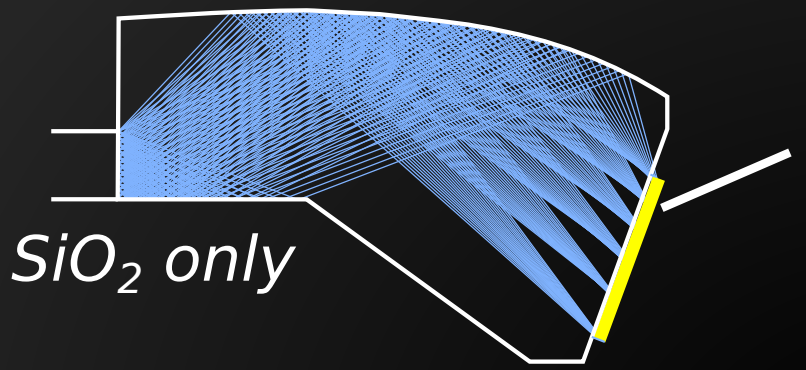
Limited lifetime

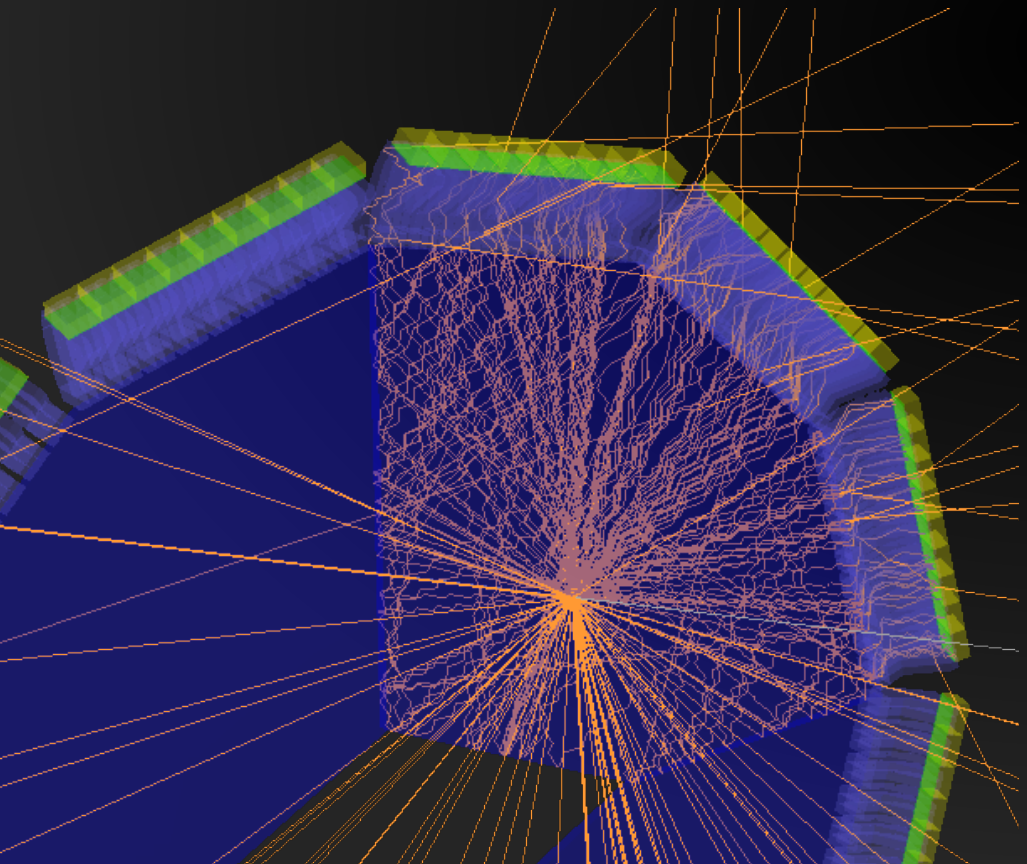
Work in progress, > 5 C/cm² is in reach

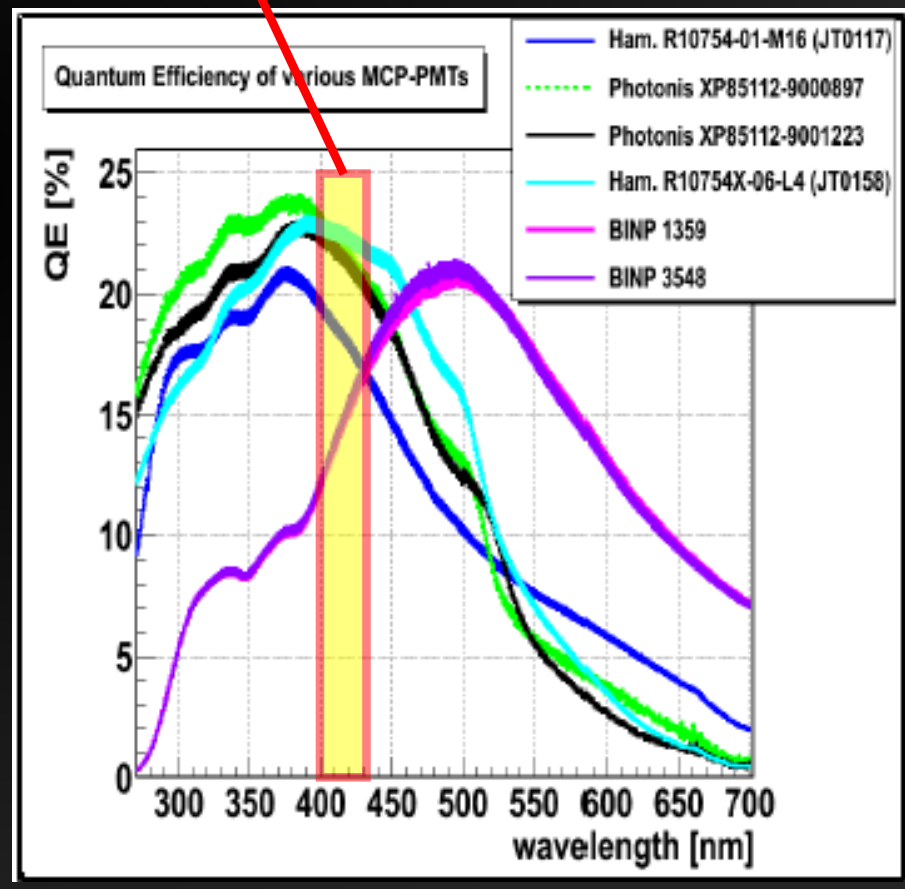
5 C/cm² translates to:
about **18 photons / track**
at **5 MHz** sustained rate

Gain 10^6, 10 MHz IR, 5 yrs continuous operation

Experiment: "LowRate" design







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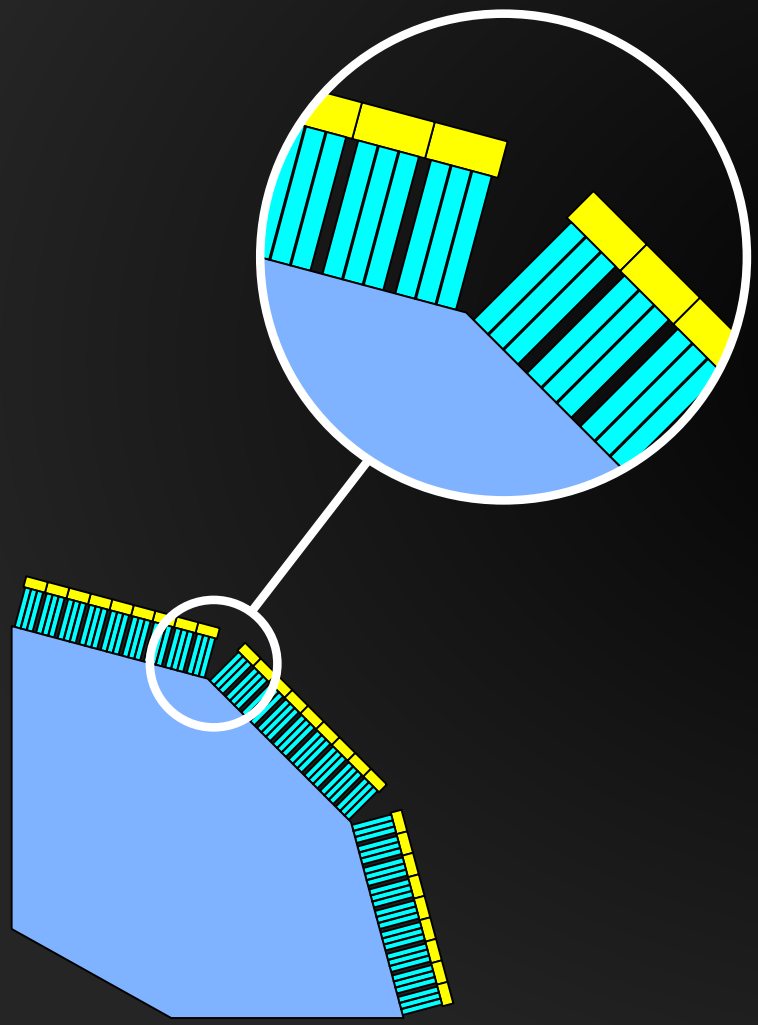
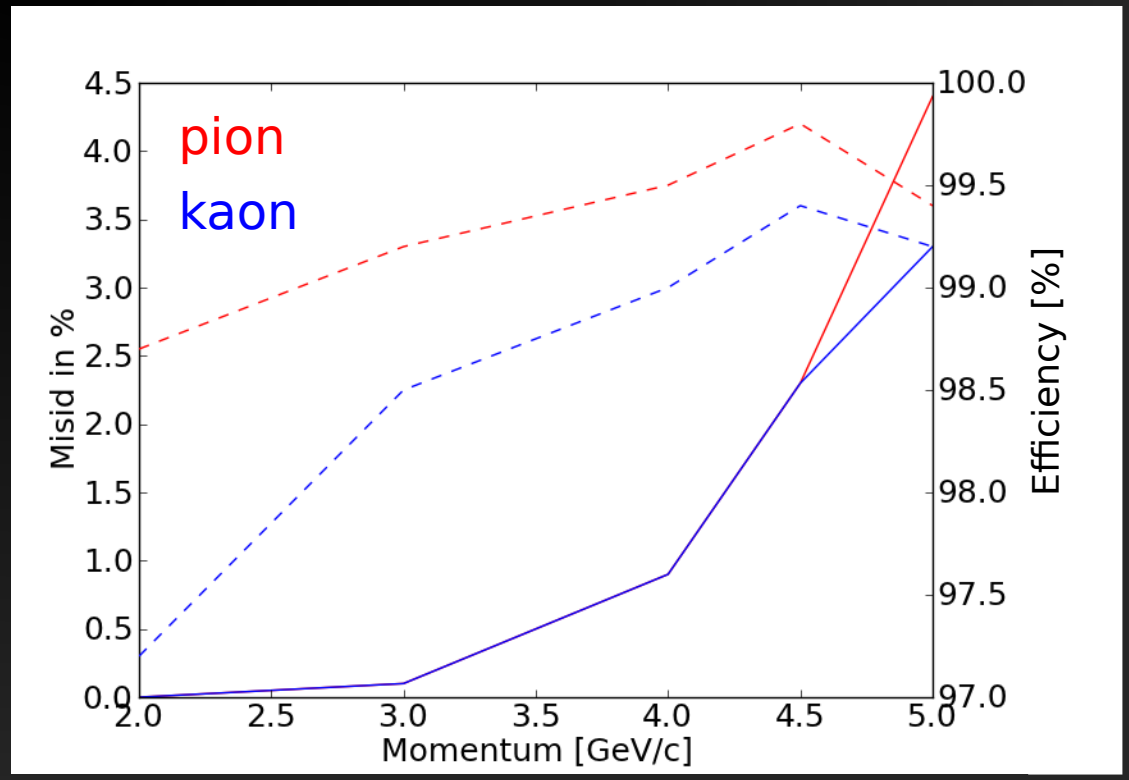
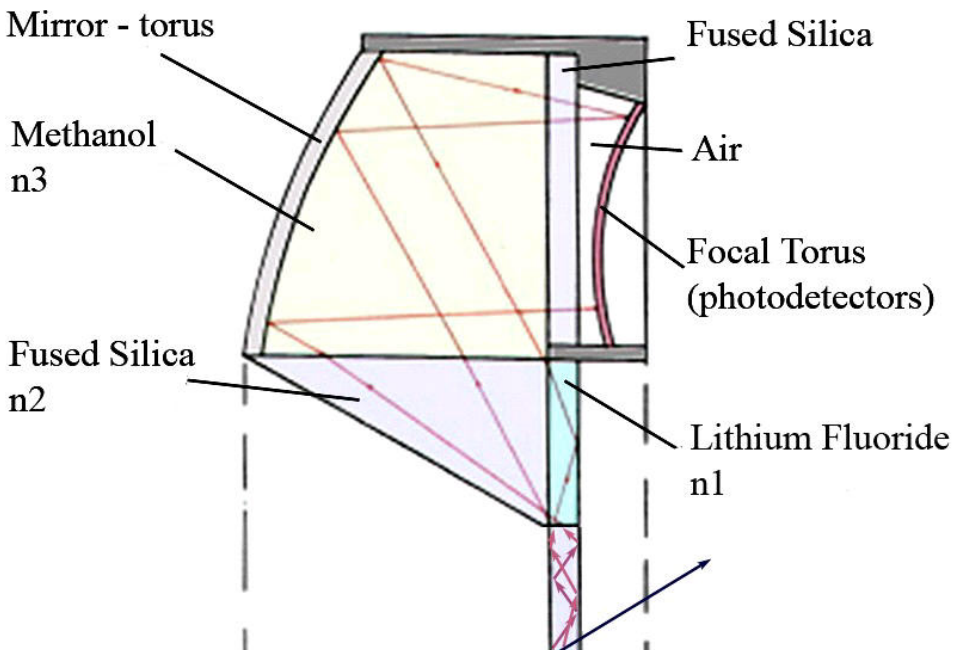


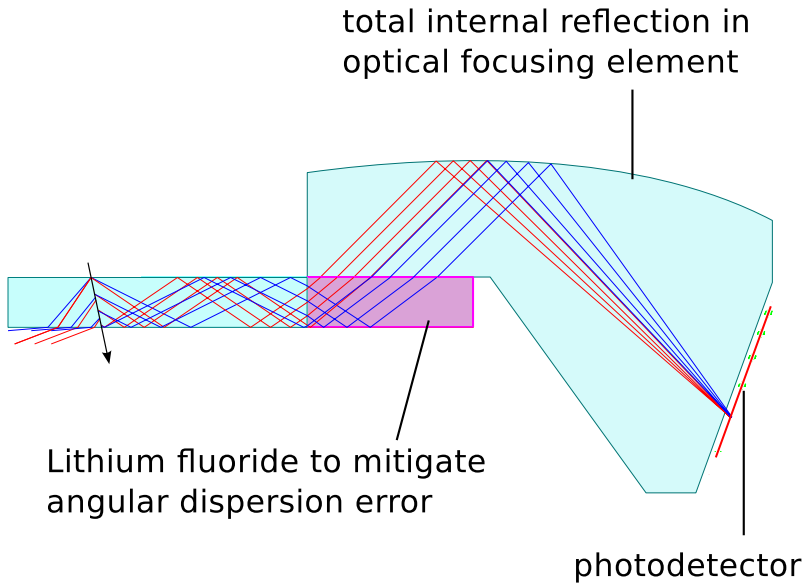
works for dSiPM geometry
but not for MCP designs
(worse geometrical acceptance)



Crystals + filter as alternative ?



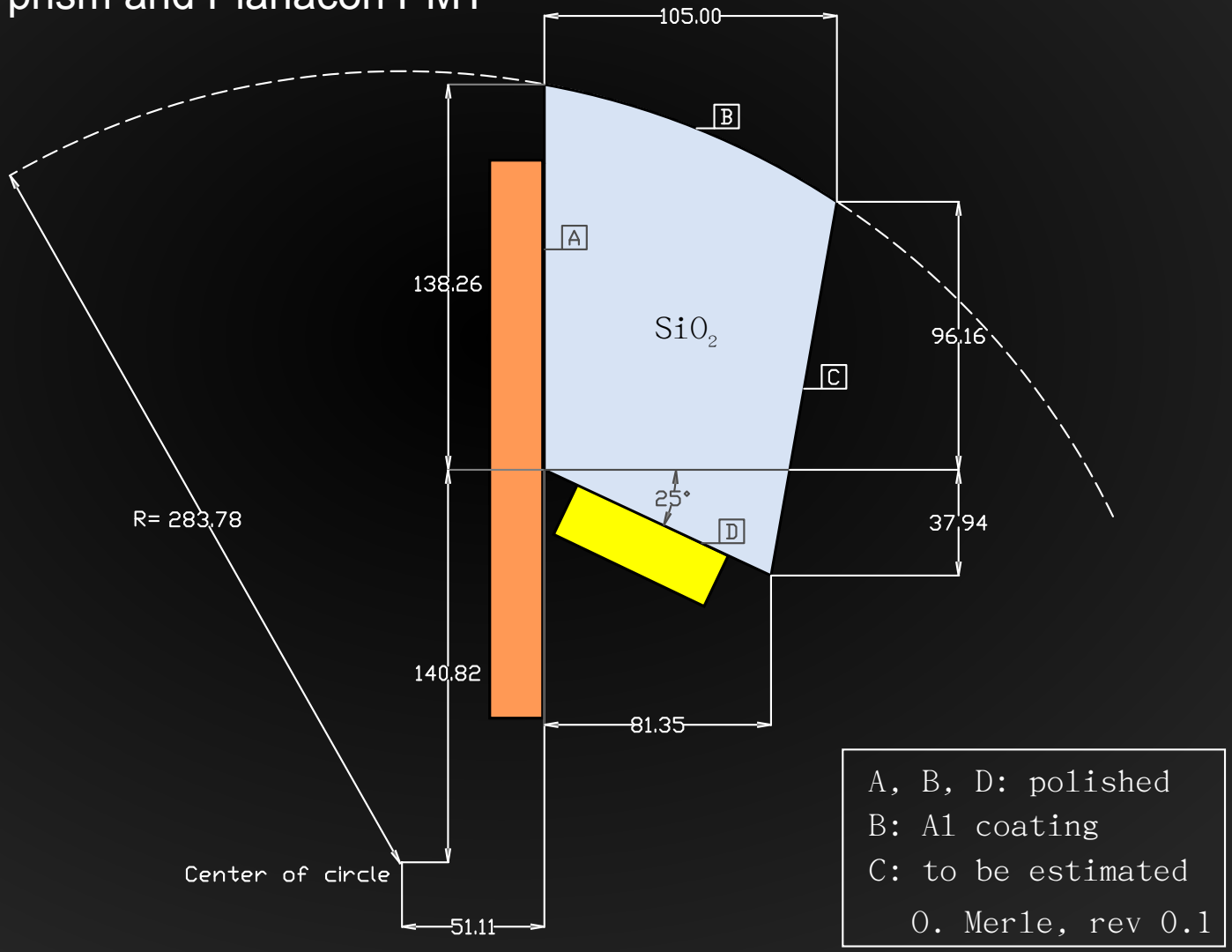
(2004) B. Morosov et al.



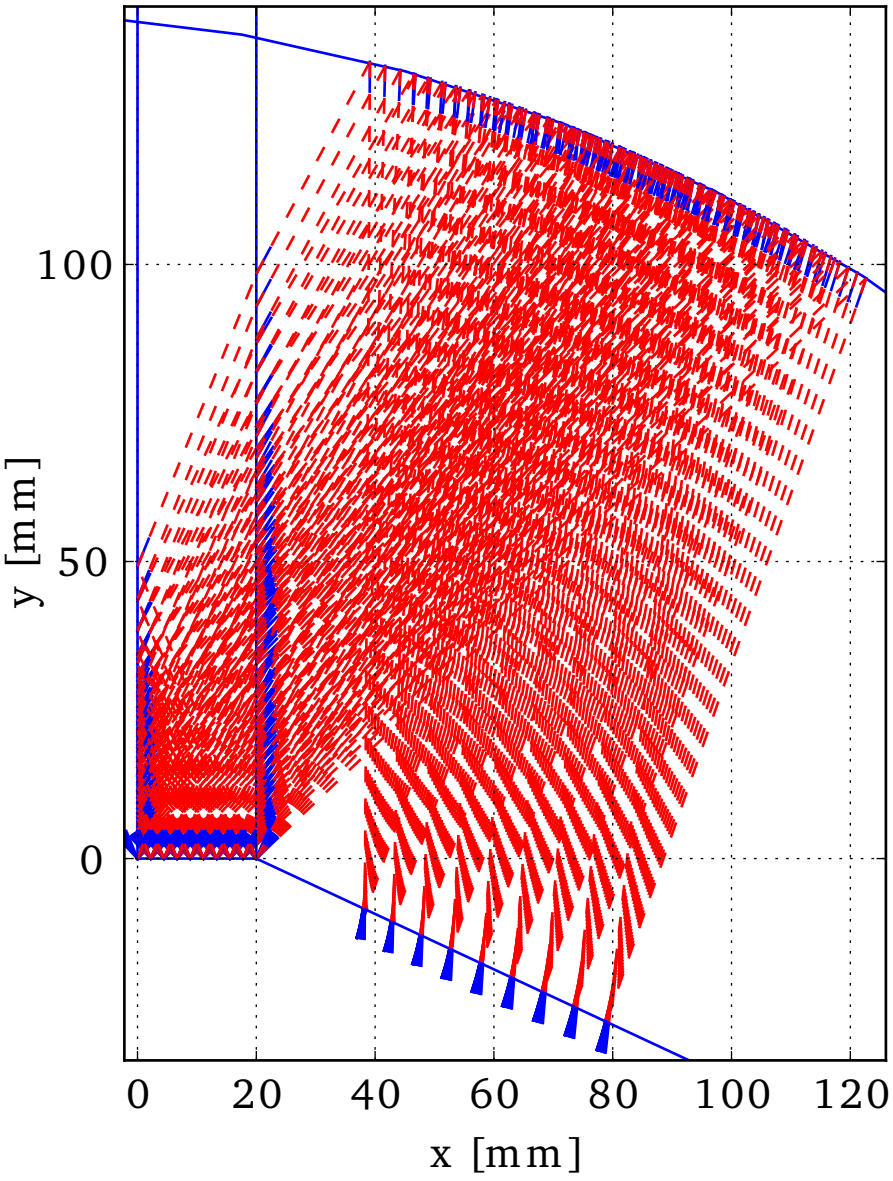
(2008) K. Föhl et al.

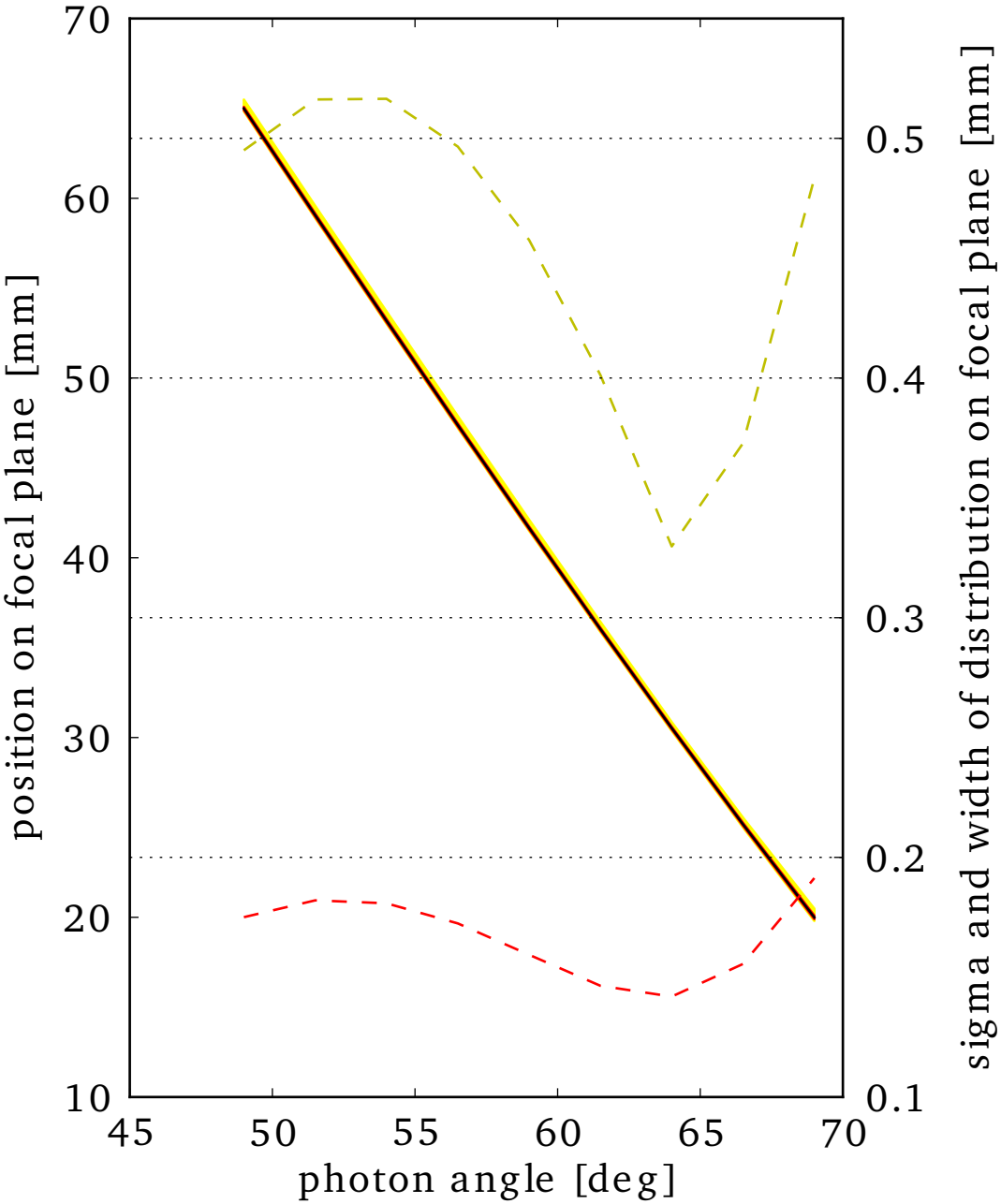
LiF without asphere !

Plano-convex cylindrical focussing element
for use with LiF prism and Planacon PMT

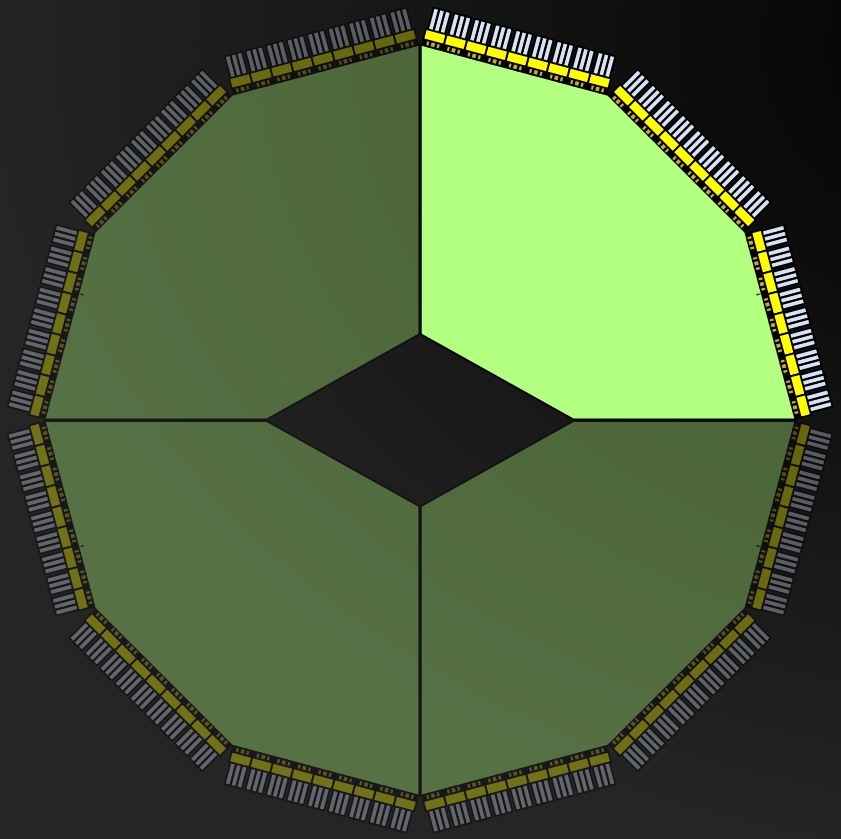


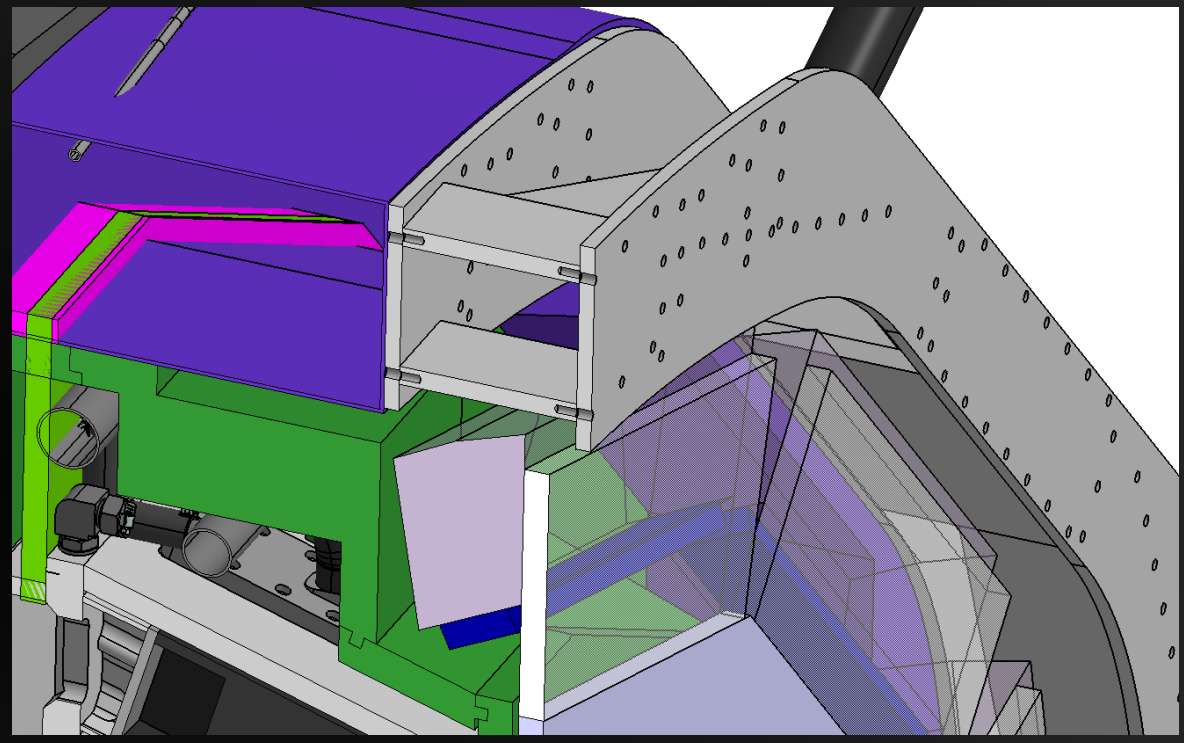
And better resolution !





Will it fit in the foreseen space ?

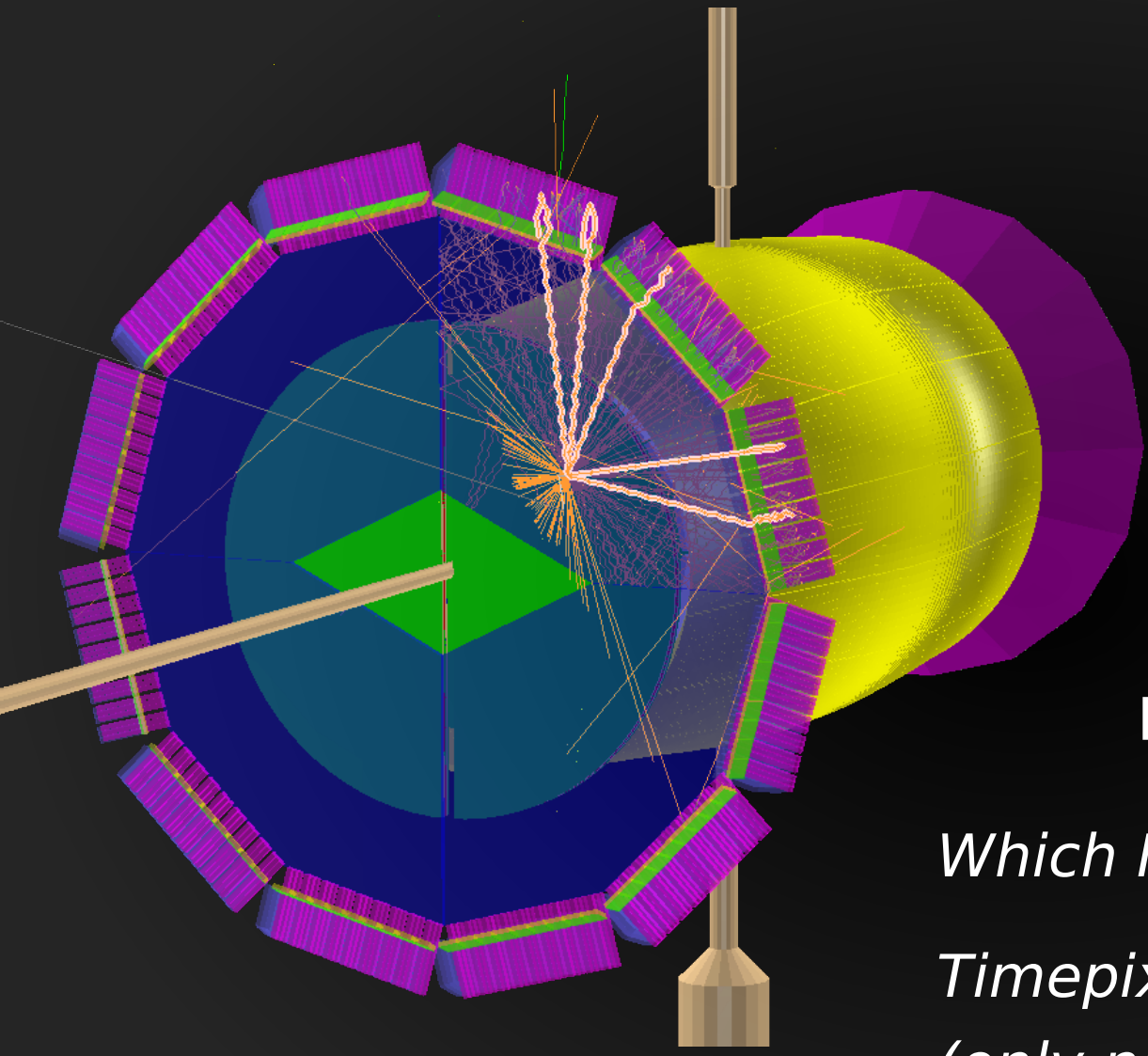




More flexible: Focusing elements can be shifted along crystals

still some fine-tuning necessary

Performance studies in preparation



Burning questions:

Which MCP-PMT anode will work?

Timepix(3) Hybrid MCP-PMT usable? (only ns resolution)

CaF_2 or LD glasses as alternative?