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K_L Flux Monitor

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Outlook

- Why?
 - K_L flux monitoring
- How?
 - Plan A
 - Plan B
 - Plan C



K_l flux monitor location

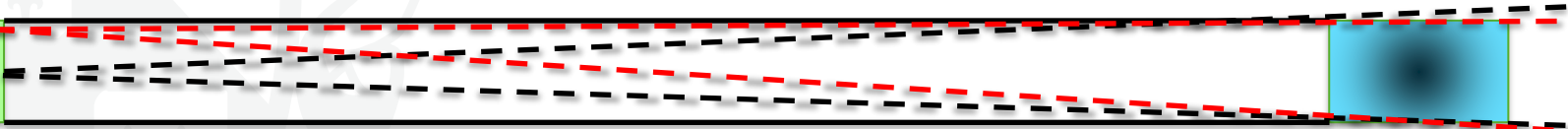
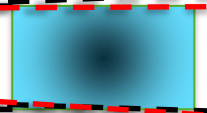
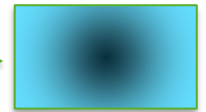


Be target

LH2/LD2 target

24 m

Flux Monitor

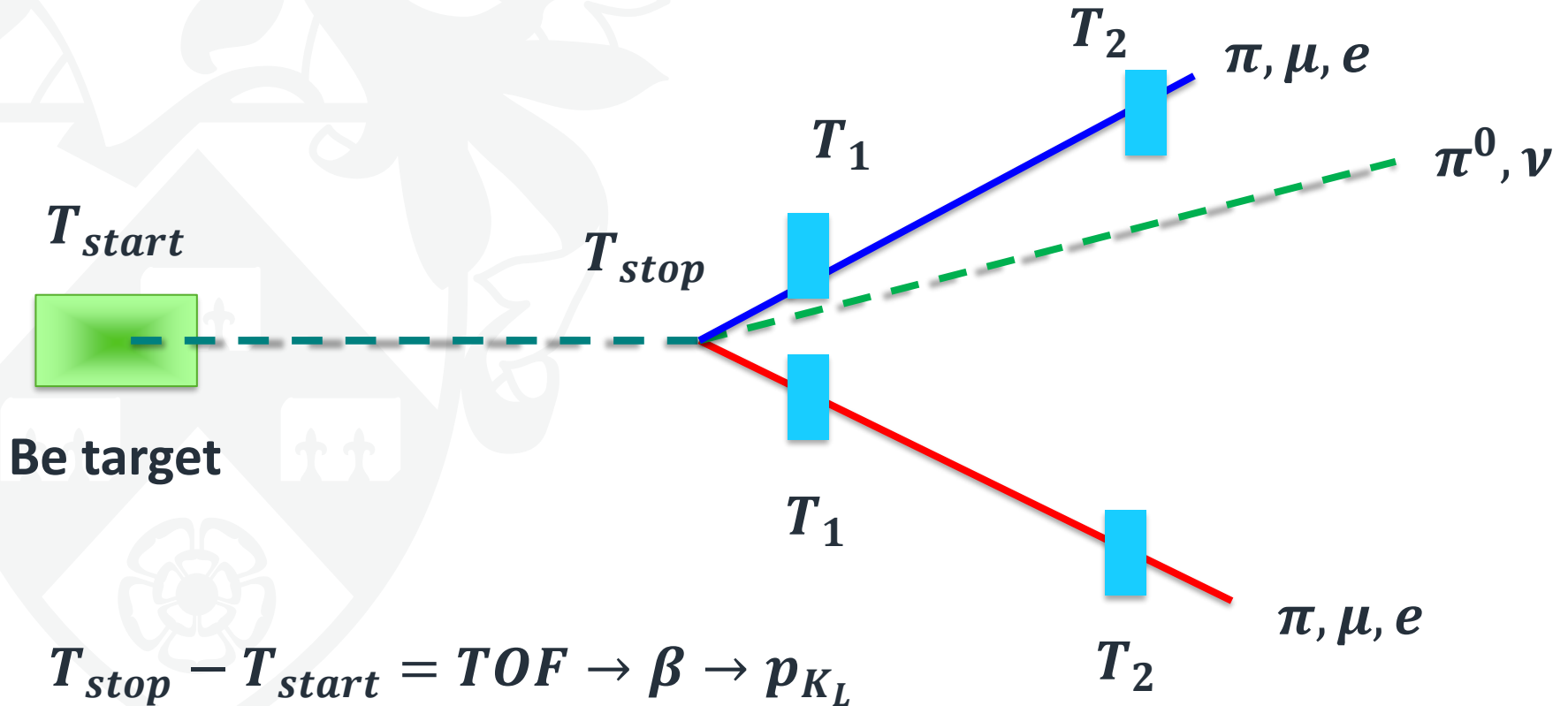


K_L decays

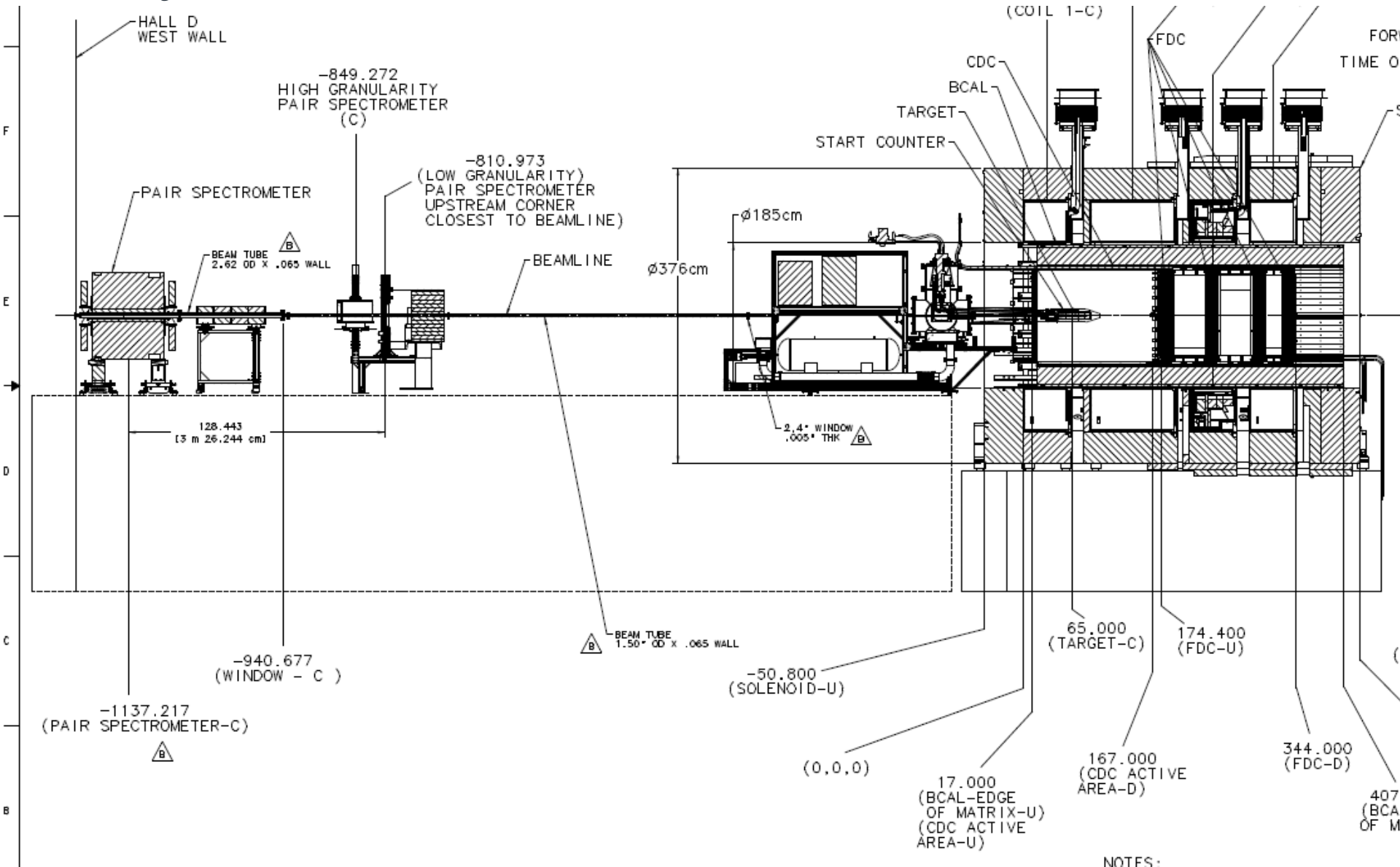
	Br, %
$K_L \rightarrow \pi^\pm e^\mp \nu_\mu$	40.55
$K_L \rightarrow \pi^\pm \mu^\mp \nu_\mu$	27.04
$K_L \rightarrow \pi^+ \pi^- \pi^0$	12.54
$K_L \rightarrow \pi^0 \pi^0 \pi^0$	19.52

- ~ 21% of kaons decays in flight
- Any decay with charged particles can be used

K_L monitoring



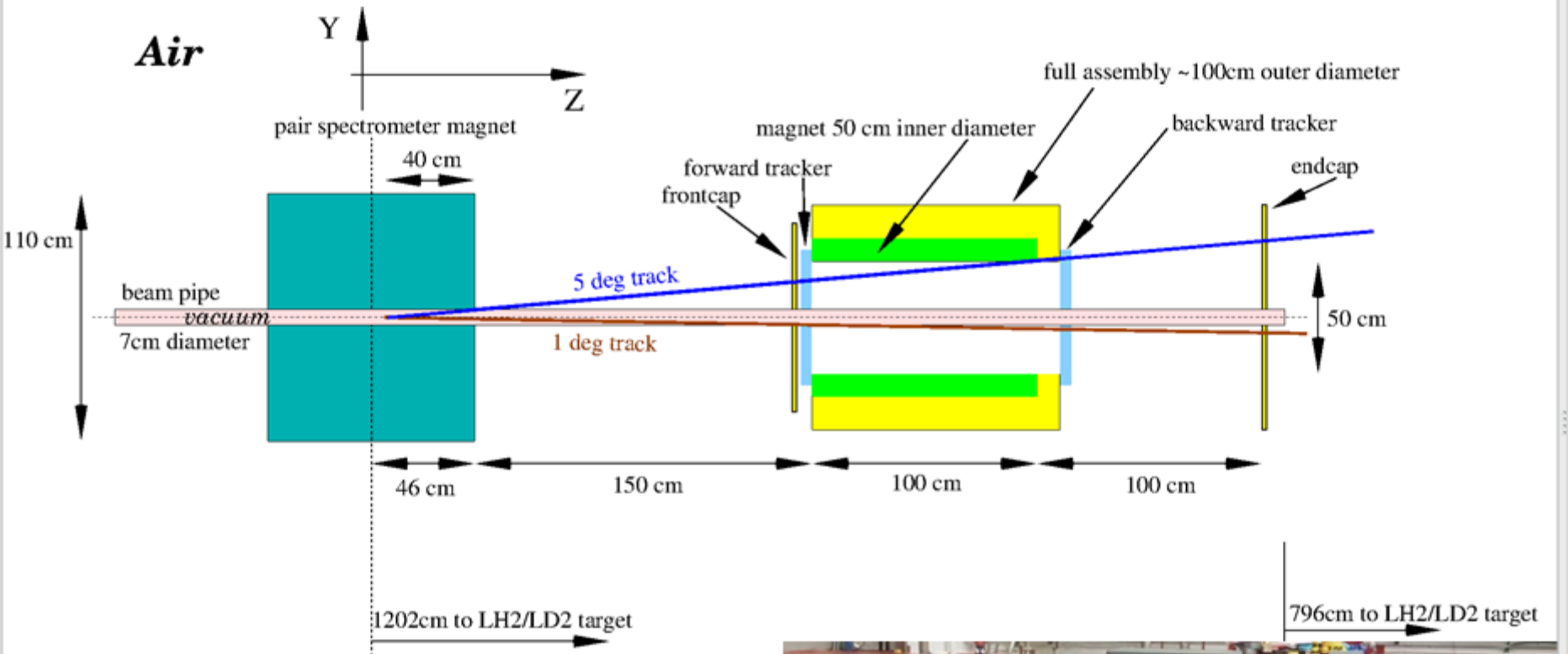
K_L flux monitor location



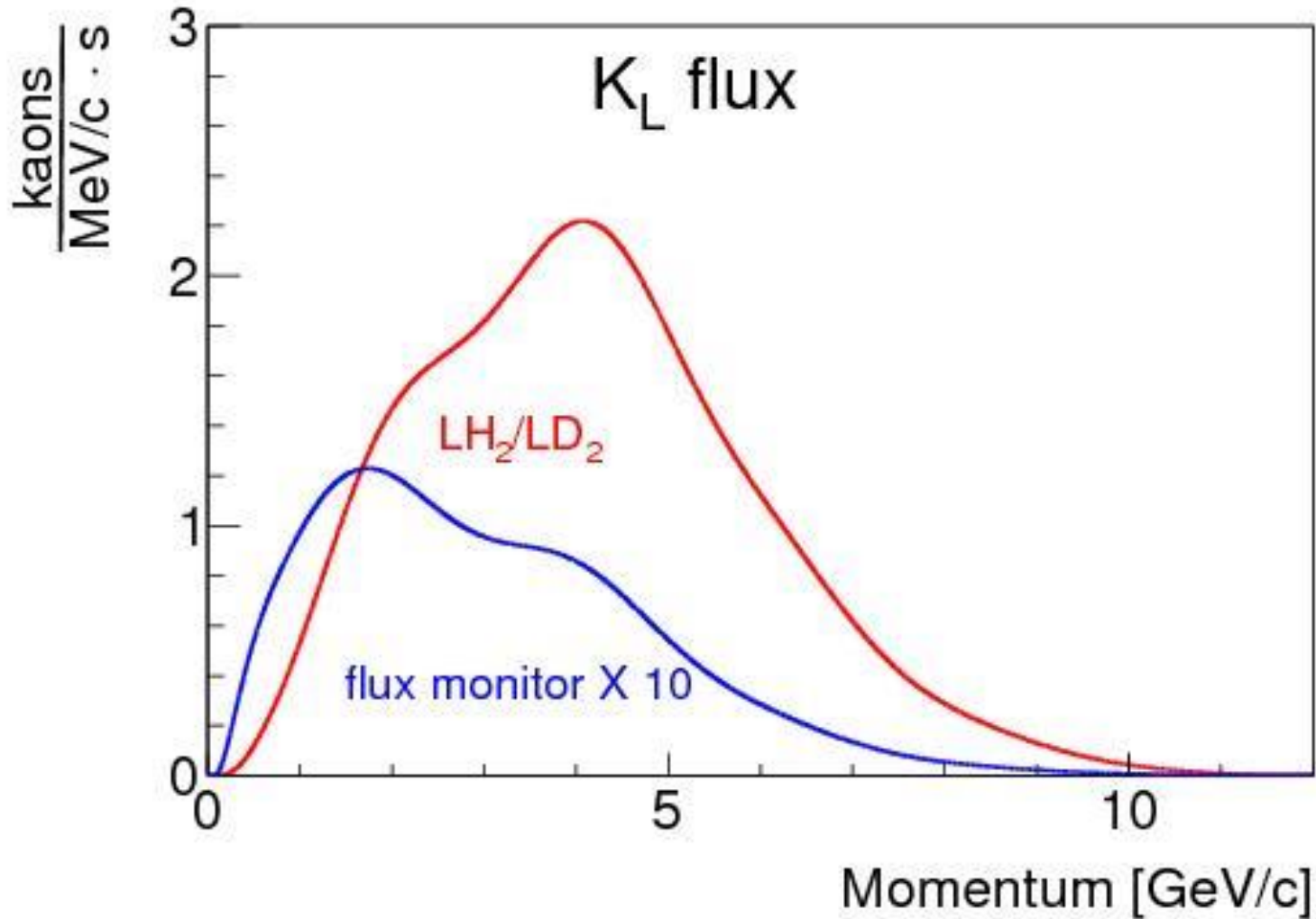
K_1F Monitor

Magnet, 1m long, 50 cm diameter

Flux Monitor

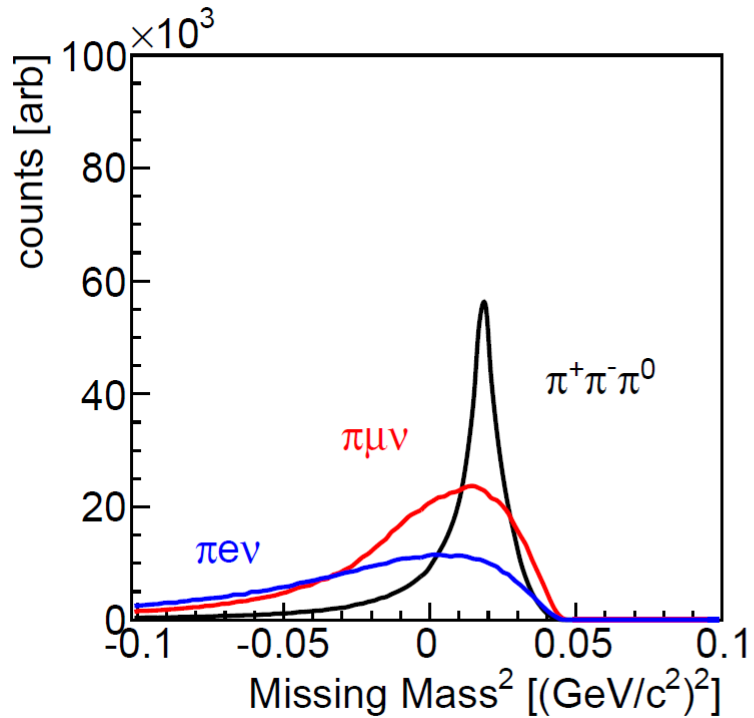


K_L spectrum

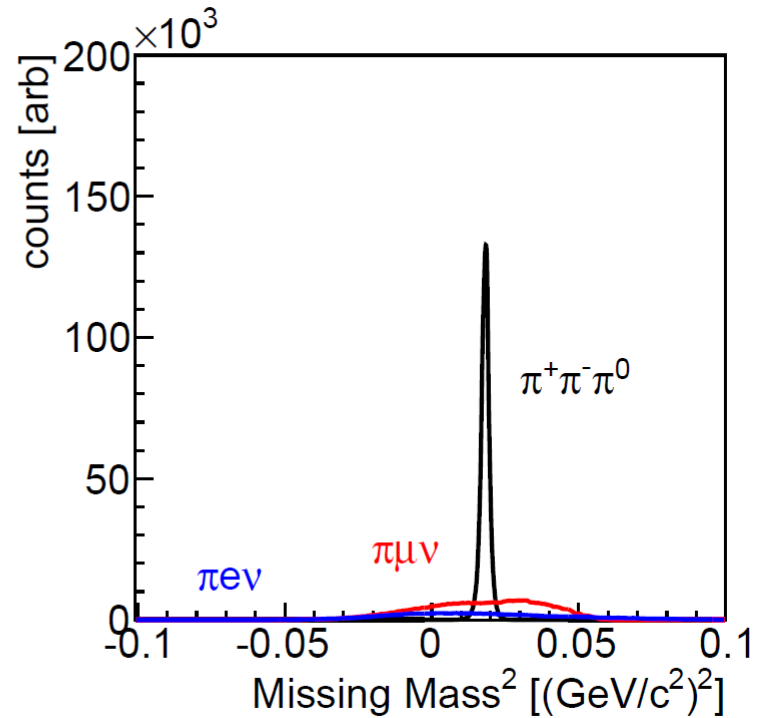


K_L FM resolution

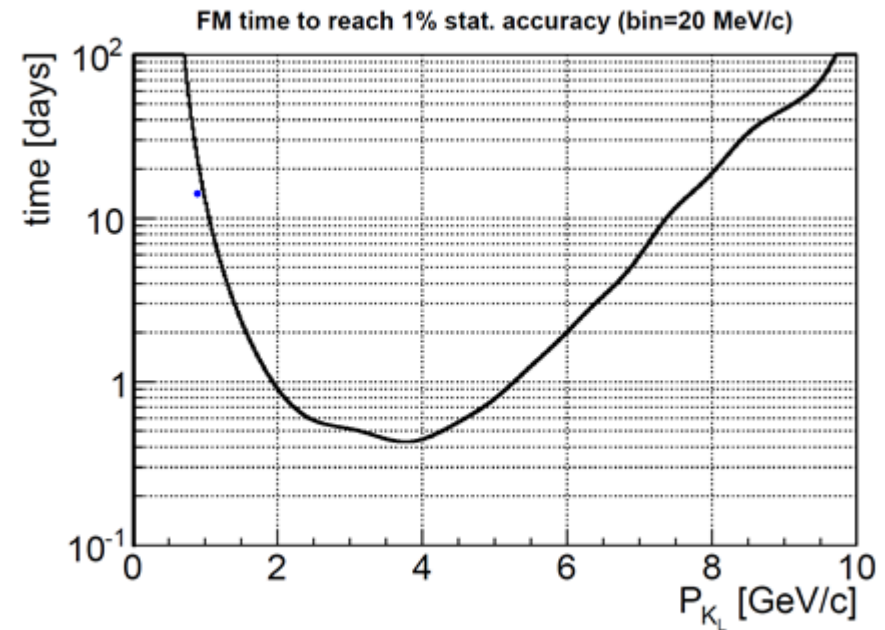
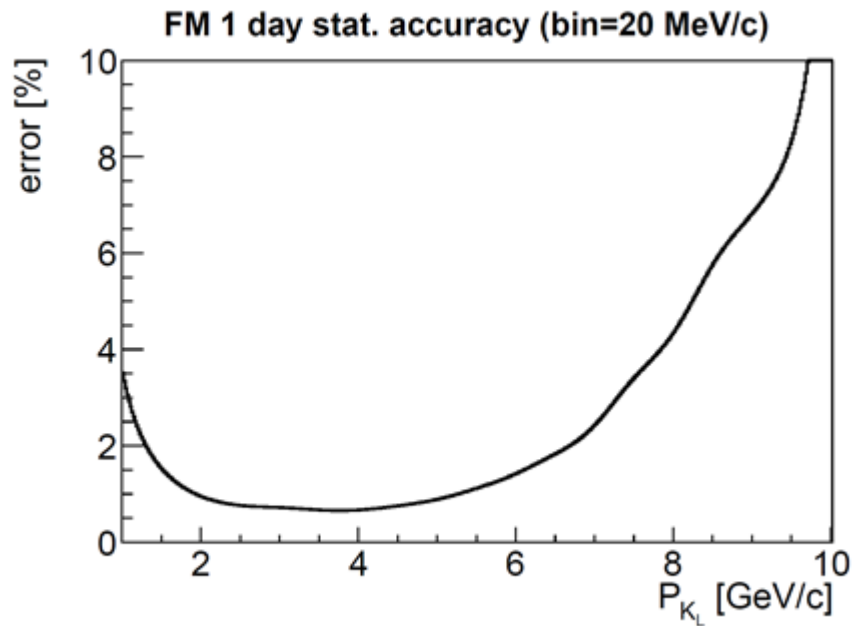
TOF reconstruction



Magnetic reconstruction



Expected stat accuracy





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Plan A'

Possible magnet



Siemens Magnetom 1.5T used MRI

Table 4: Magnet specification

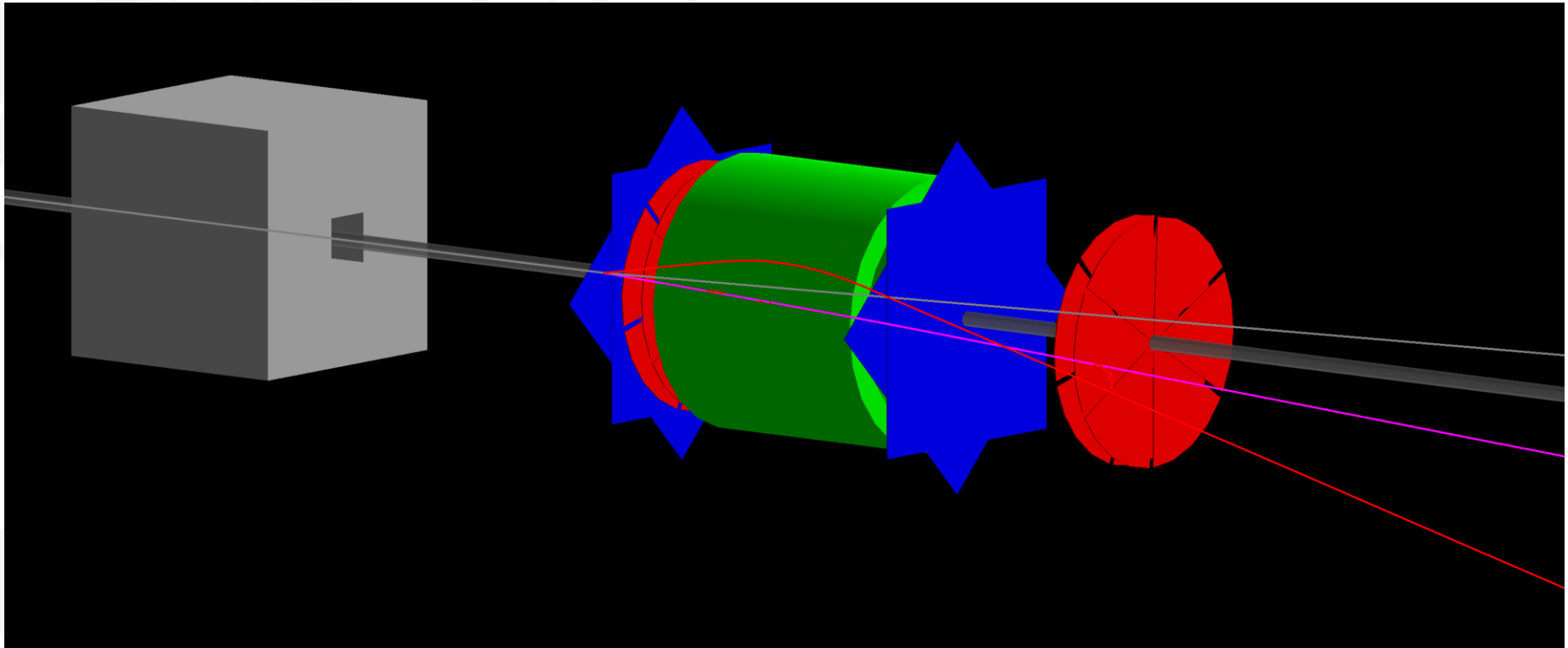
Parameter	Siemens
RF frequency MHz	63.6
Shielding	Passive and active
Homogeneity (VRMS) 40 cm DSV ppm	0.2 (typically)
Field stability ppm/hr	< 0.1
Number of measurement planes	24
Number of measurement points	20
Cooling system	Liquid helium only
Boil-off rate l/hr	0
Helium refill	10 years maximum (approximately)

Table 7: Installation details

Overall scanner dimensions	Siemens
Mass: magnet only tonnes	3.55 ± 8(including helium)
Mass: assembly tonnes	5.5
Depth with covers (z) cm	160
Width with covers (x) cm	230
Height with covers (y) cm	230

~70kEuro+delivery

Simulations



Less background with dipole "ON"

Status

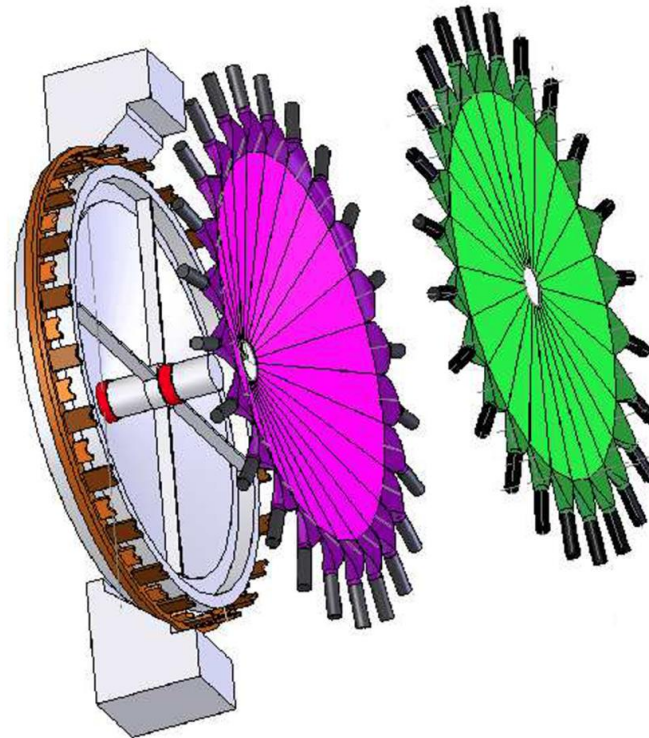
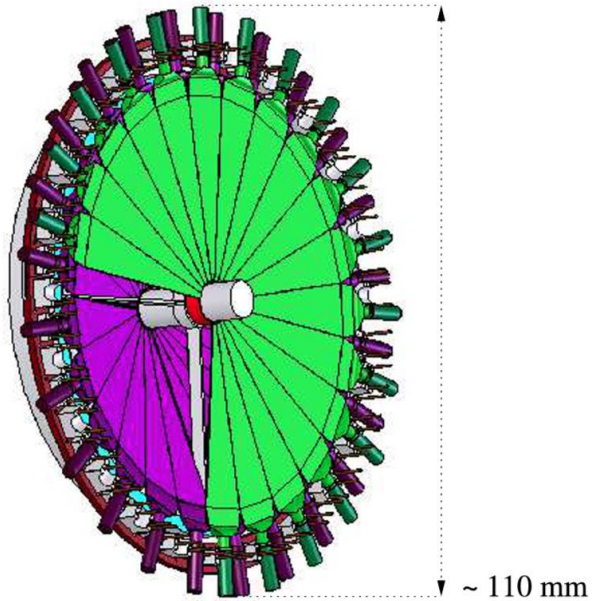
- Applied for the equipment grant STFC UK
 - Stage 1 – OK
 - Stage 2 – full application – Oct2022-Feb2023
- Prototyping fast TOF (together with Chem. UoY)
 - Fast plastic scintillators
 - Liquid scintillators
 - Cherenkov as TOF (reference)



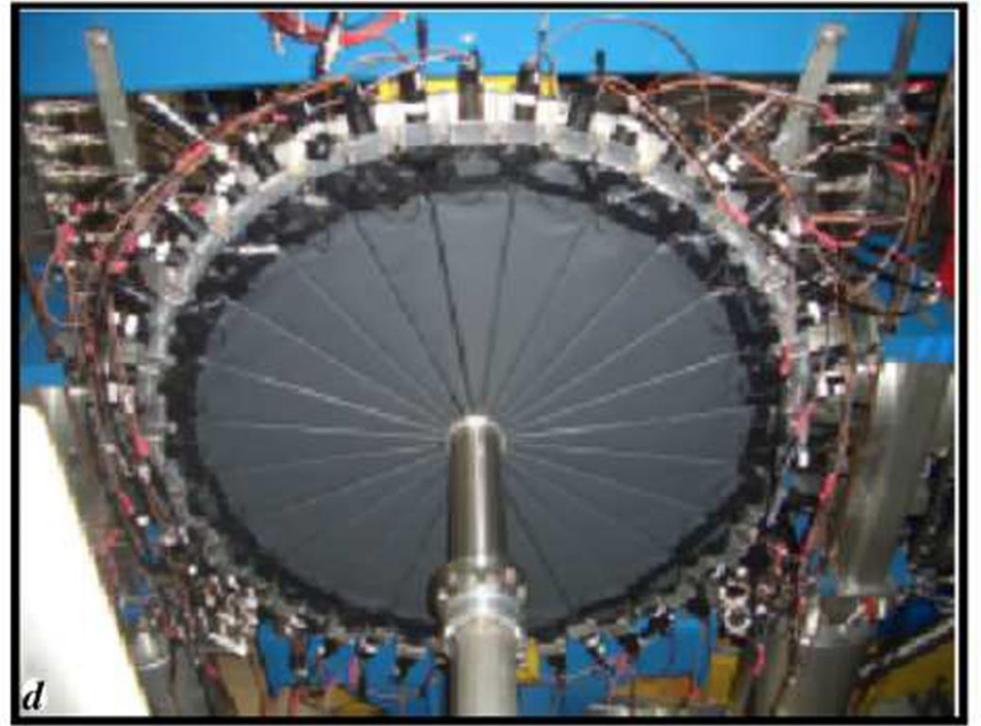
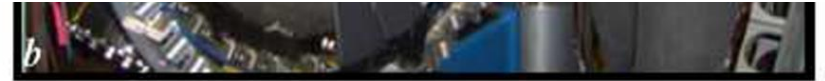
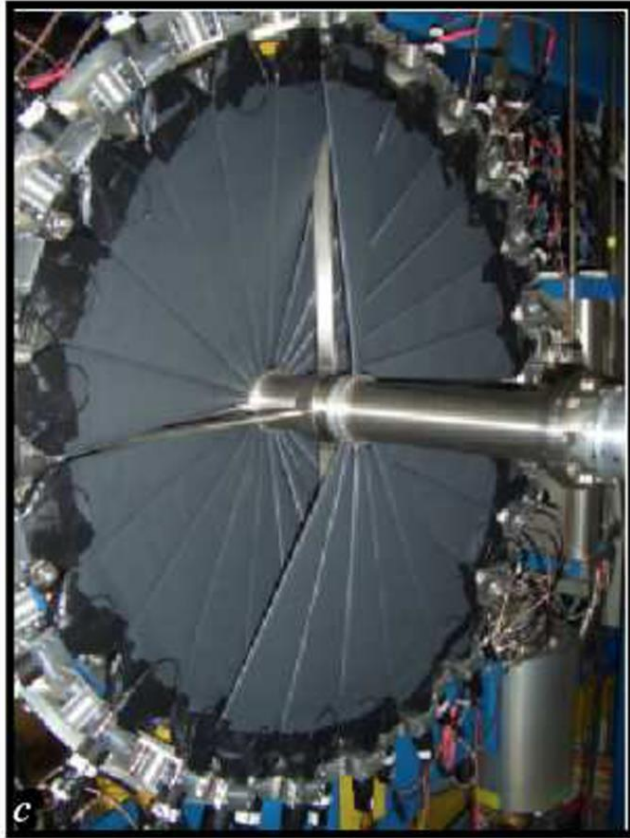
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Plan B

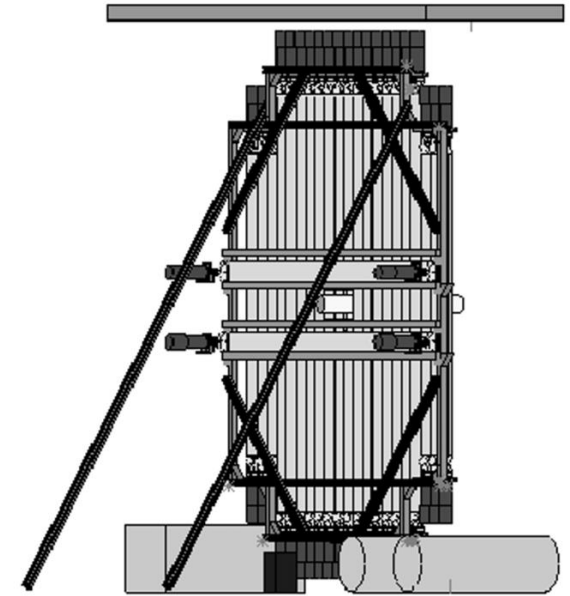
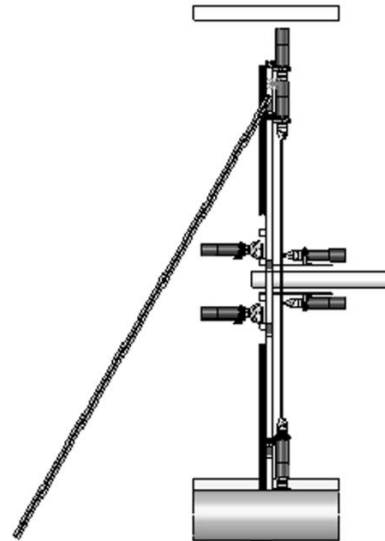
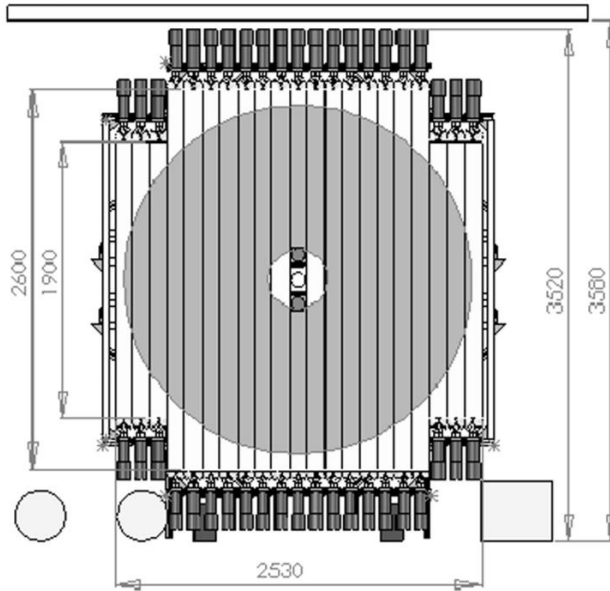
Wasa detectors



Wasa detectors



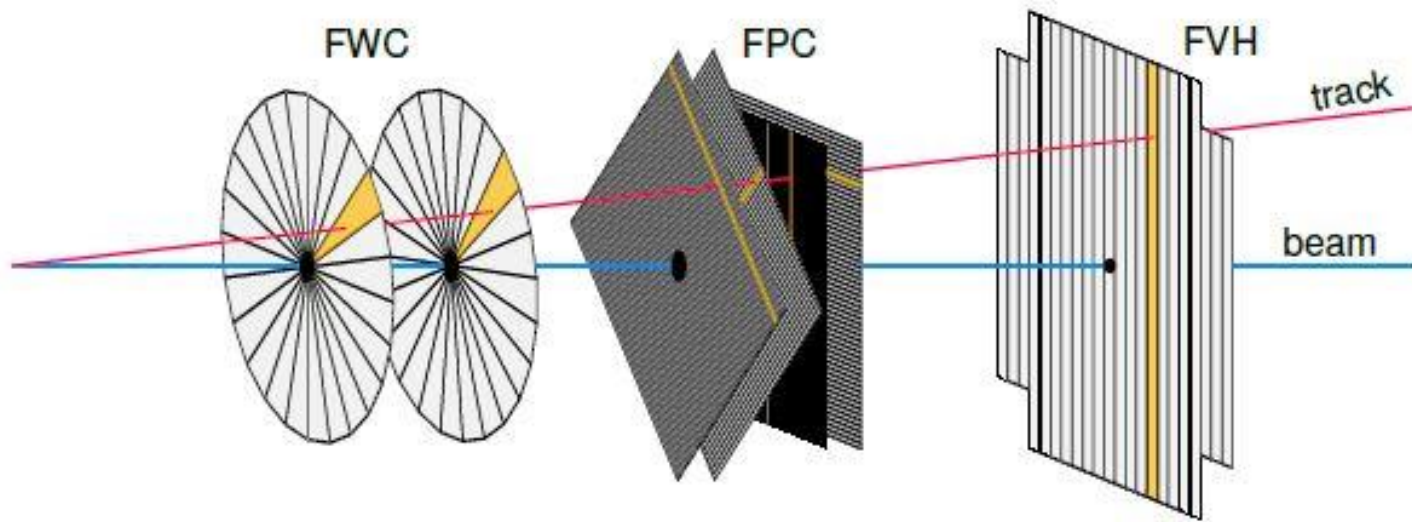
Wasa detectors



Wasa detectors

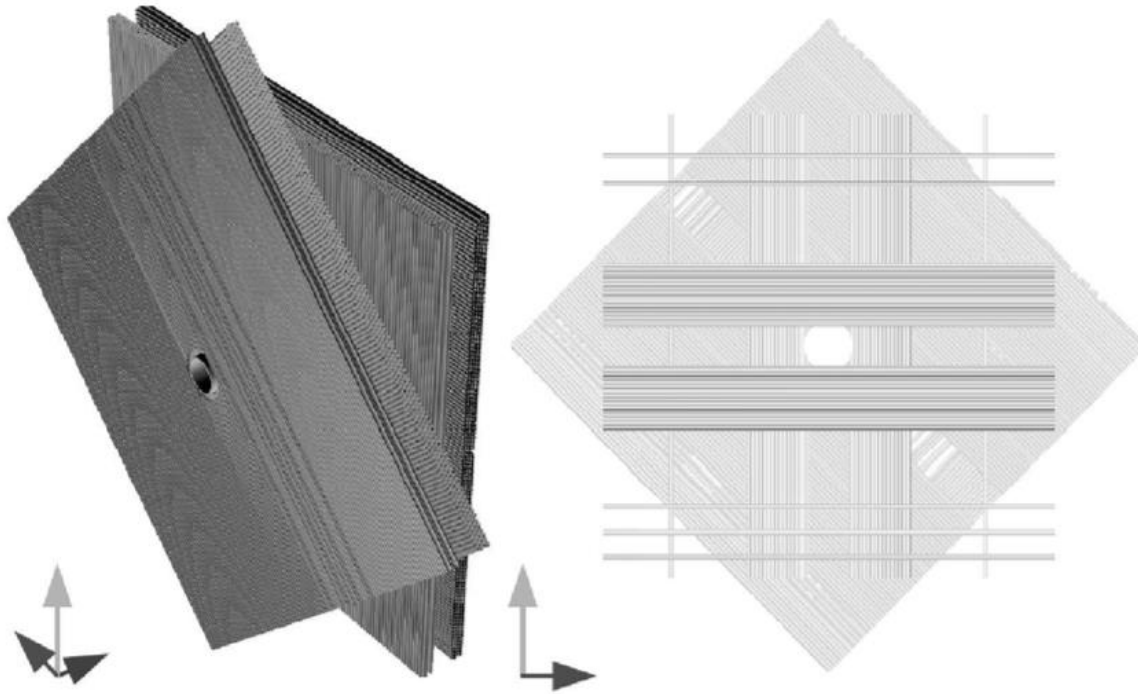


Wasa detectors



Used in TOF mode for the isospin violating $dd \rightarrow {}^4\text{He}\pi^0$ experiment

Wasa detectors



(b) *Forward Proportional Chamber FPC*

Status

- FWC (TOF start) and FVH (TOF stop)
 - Agreed on use
 - Available from 2024 (may be earlier)
- Tracker
 - Discussions in progress

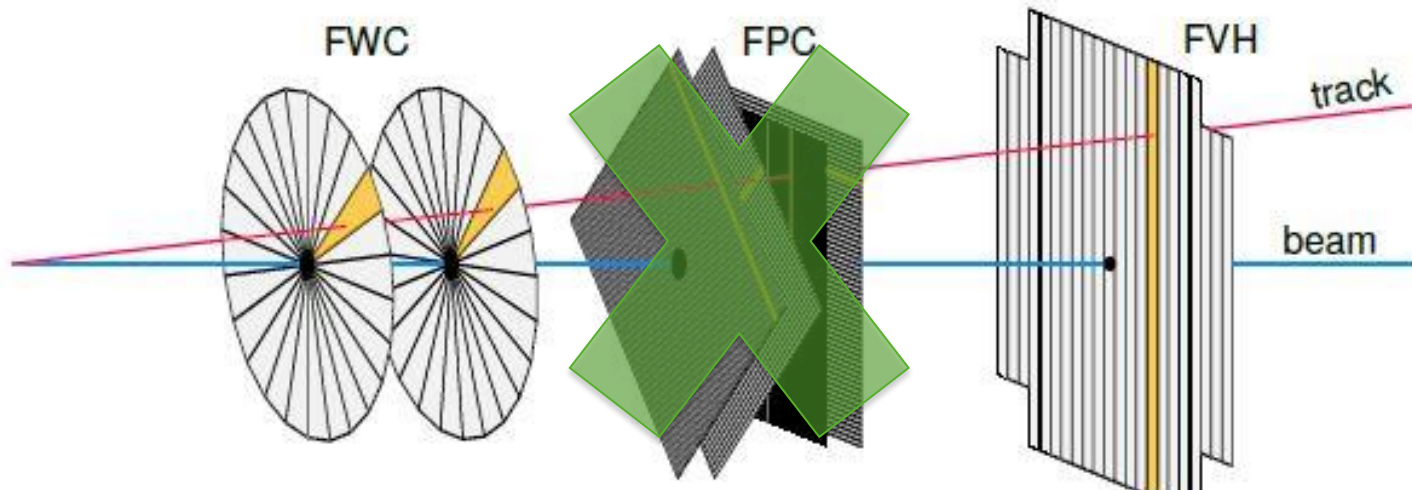


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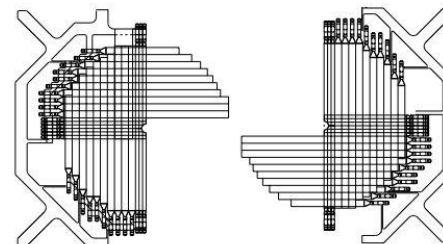
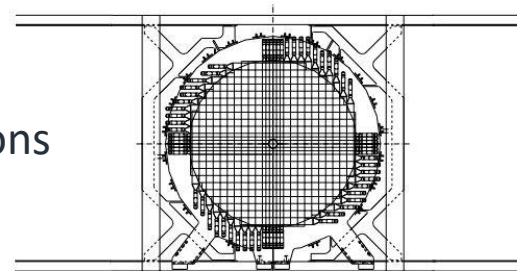
Plan C

DO WE NEED PRECISE TRACKER?

Wasa detectors



2 plastic bars detector at start and stop locations
Instead of tracker



Status

- FWC (TOF start) and FVH (TOF stop)
 - Agreed on use
 - Available from 2024 (may be earlier)
- FRI can be negotiated
- “Start” bar tracker partly reutilizing FM prototyping

Conclusion



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