



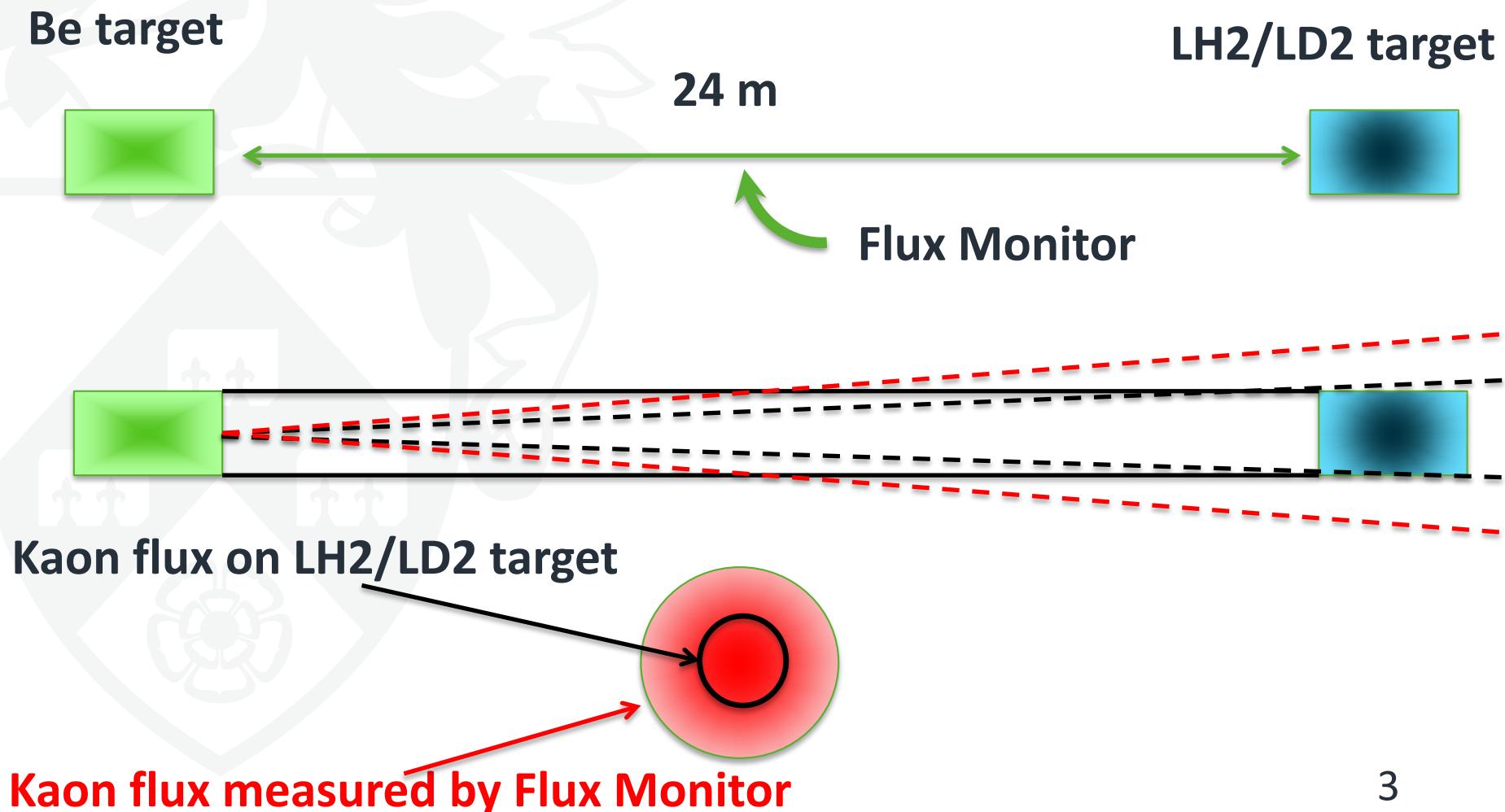
K_L Flux Monitor

Mikhail Bashkanov

Outlook

- Why?
 - K_L flux monitoring
- How?
 - Basic principles
 - FM Design

K_l flux monitor location



K_L decays

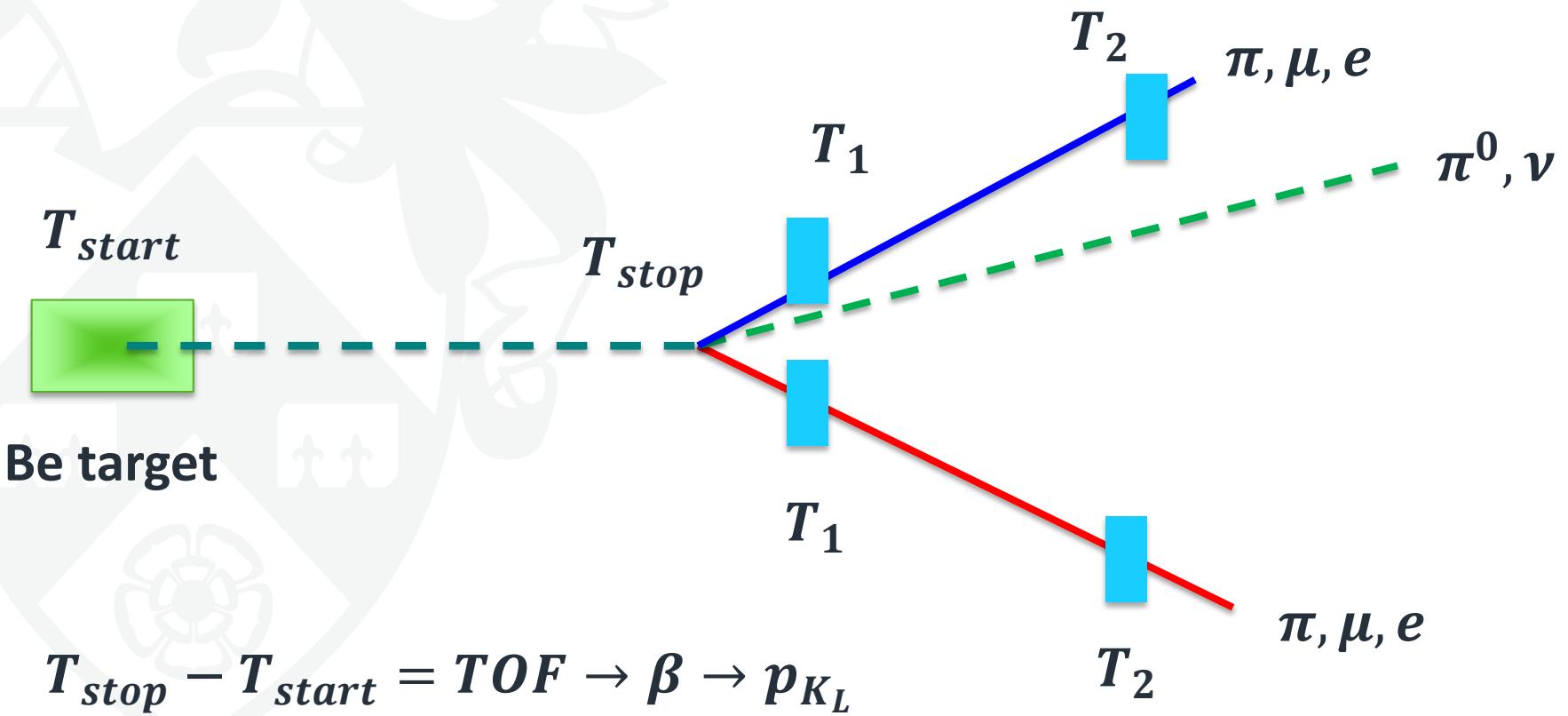
	Br, %
$K_l \rightarrow \pi^\pm e^\mp \nu_\mu$	40.55
$K_l \rightarrow \pi^\pm \mu^\mp \nu_\mu$	27.04
$K_l \rightarrow \pi^+ \pi^- \pi^0$	12.54
$K_l \rightarrow \pi^0 \pi^0 \pi^0$	19.52

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

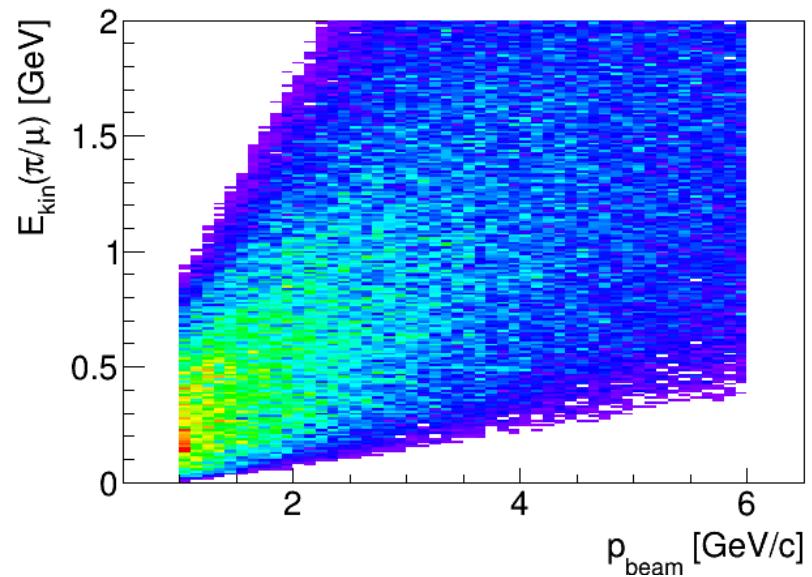
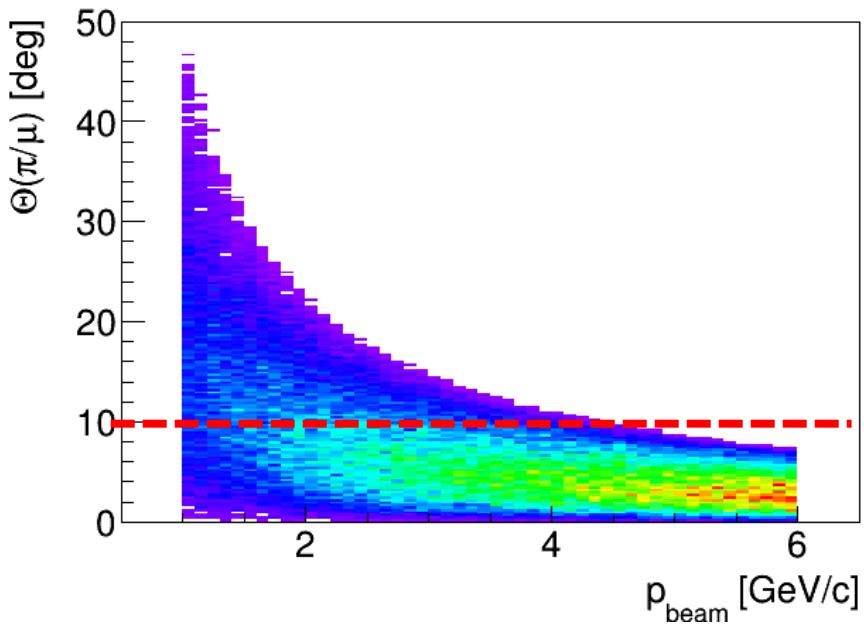
K_L monitoring



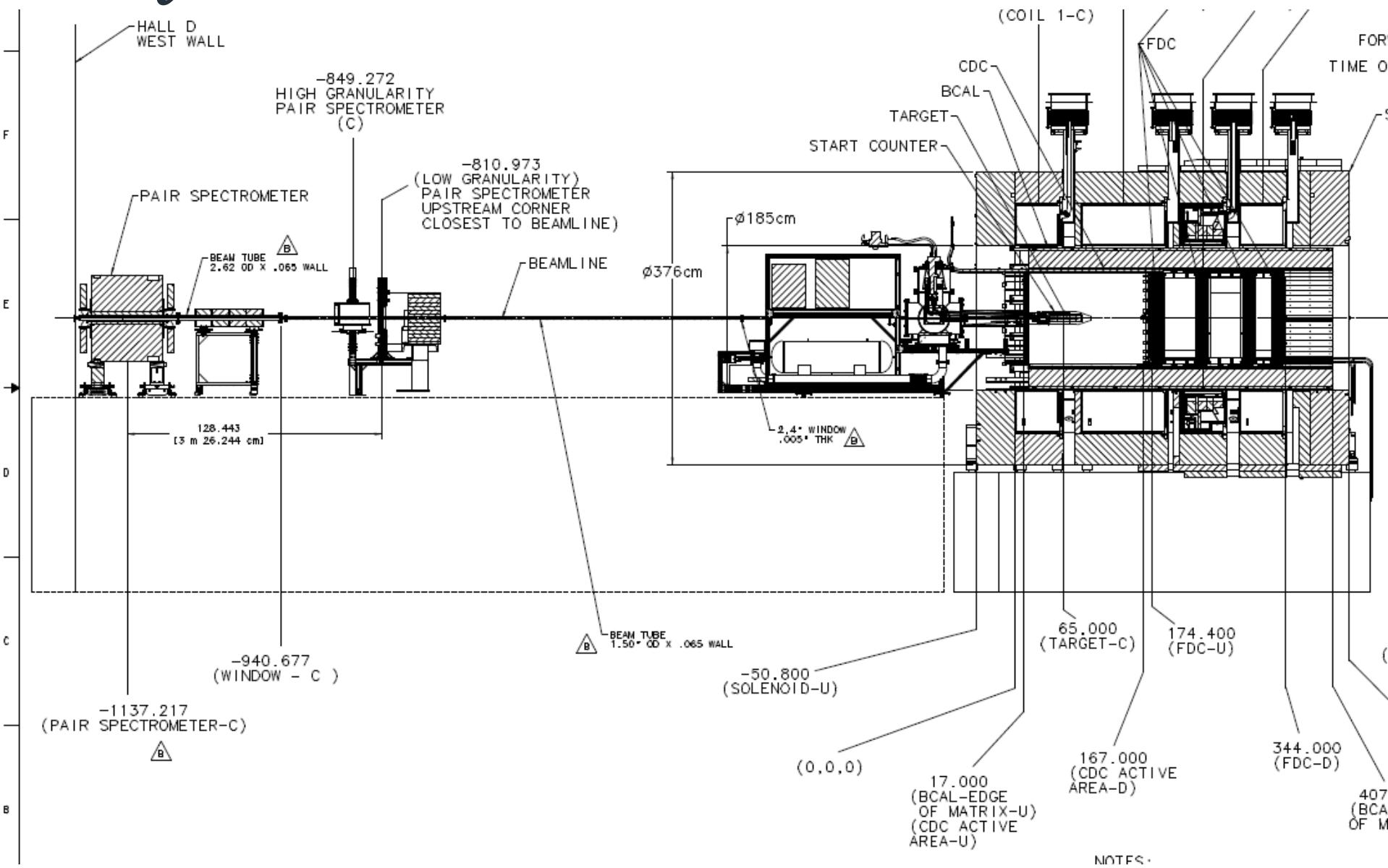
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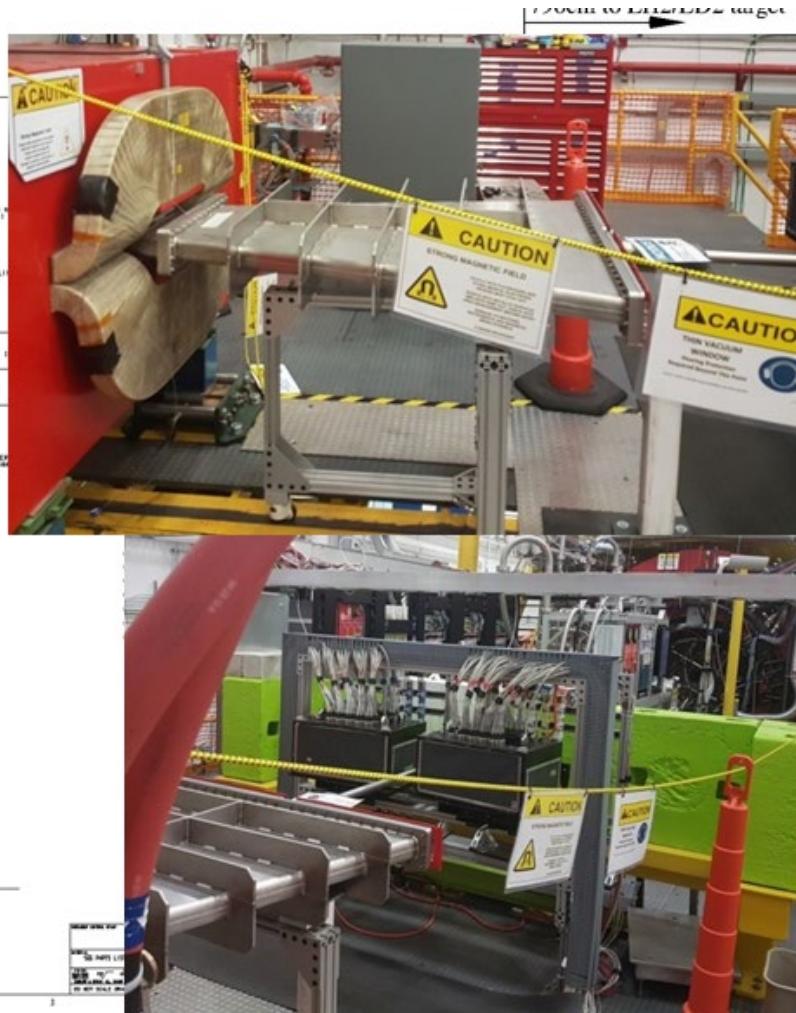
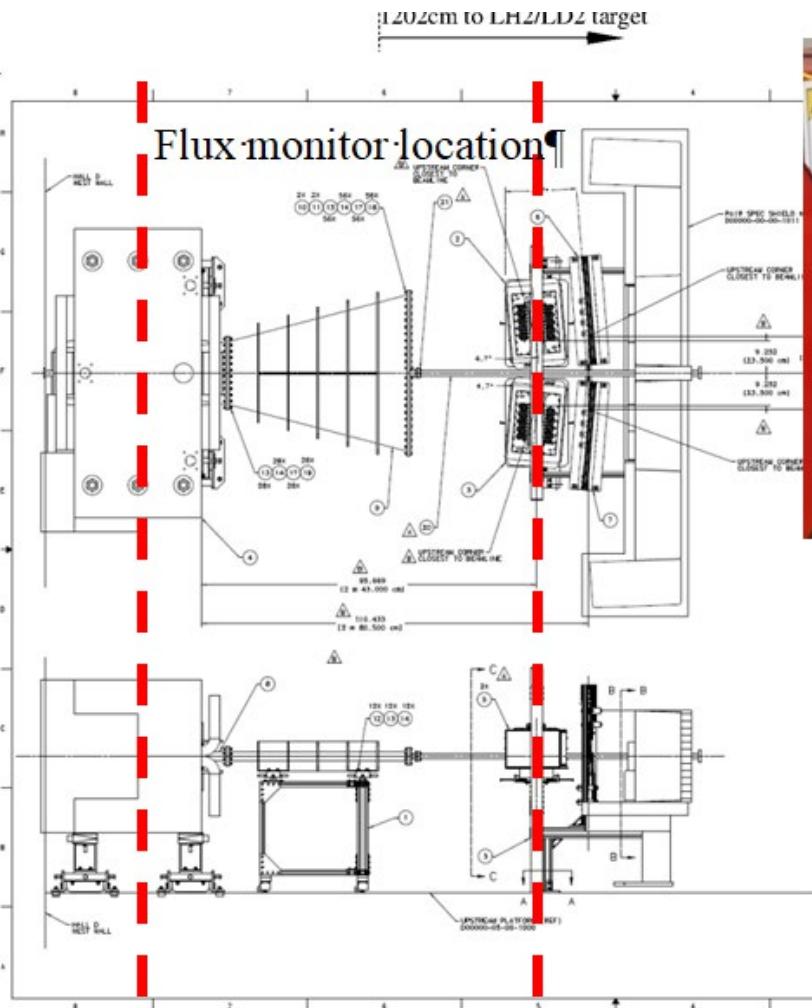
$K_l \rightarrow \pi^\pm \mu^\mp \nu_\mu$ reaction kinematics



K_l flux monitor location



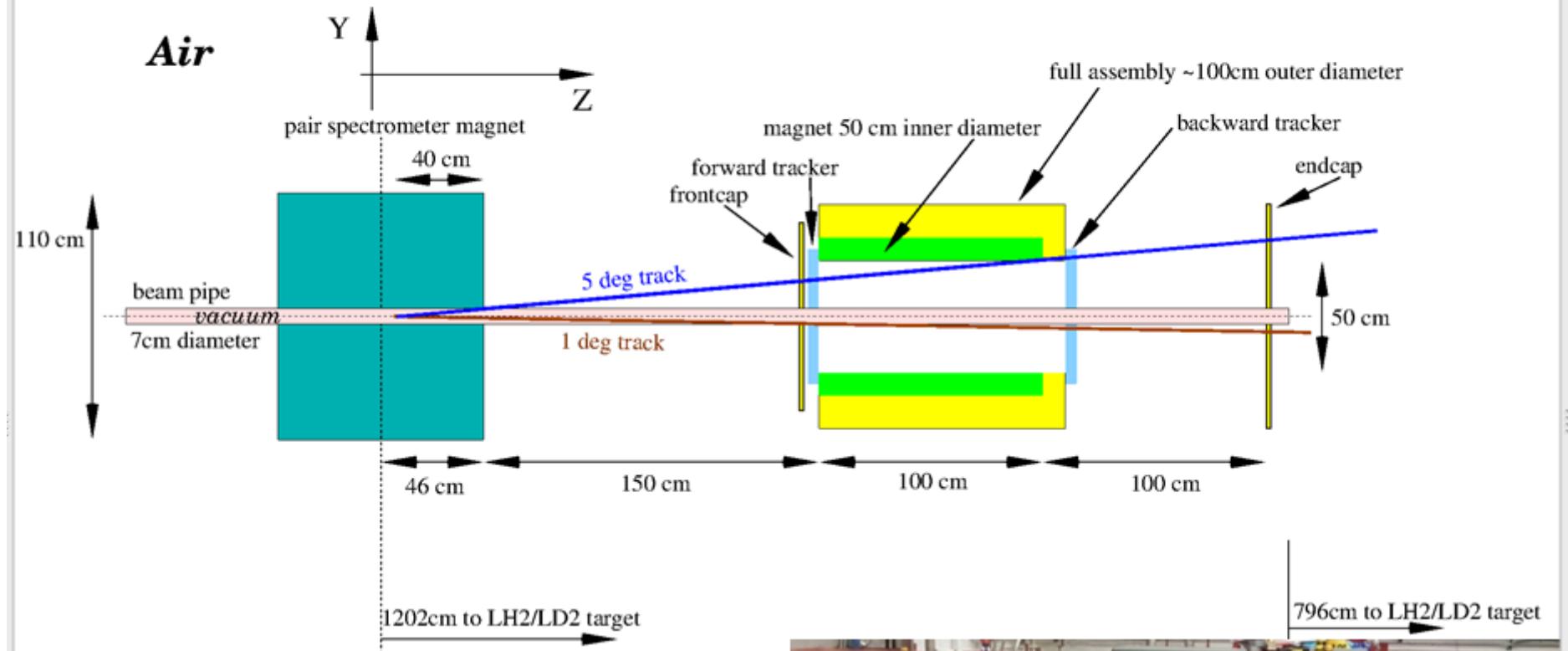
Flux monitor location



$K_l F$ Monitor

Magnet, 1m long, 50 cm diameter

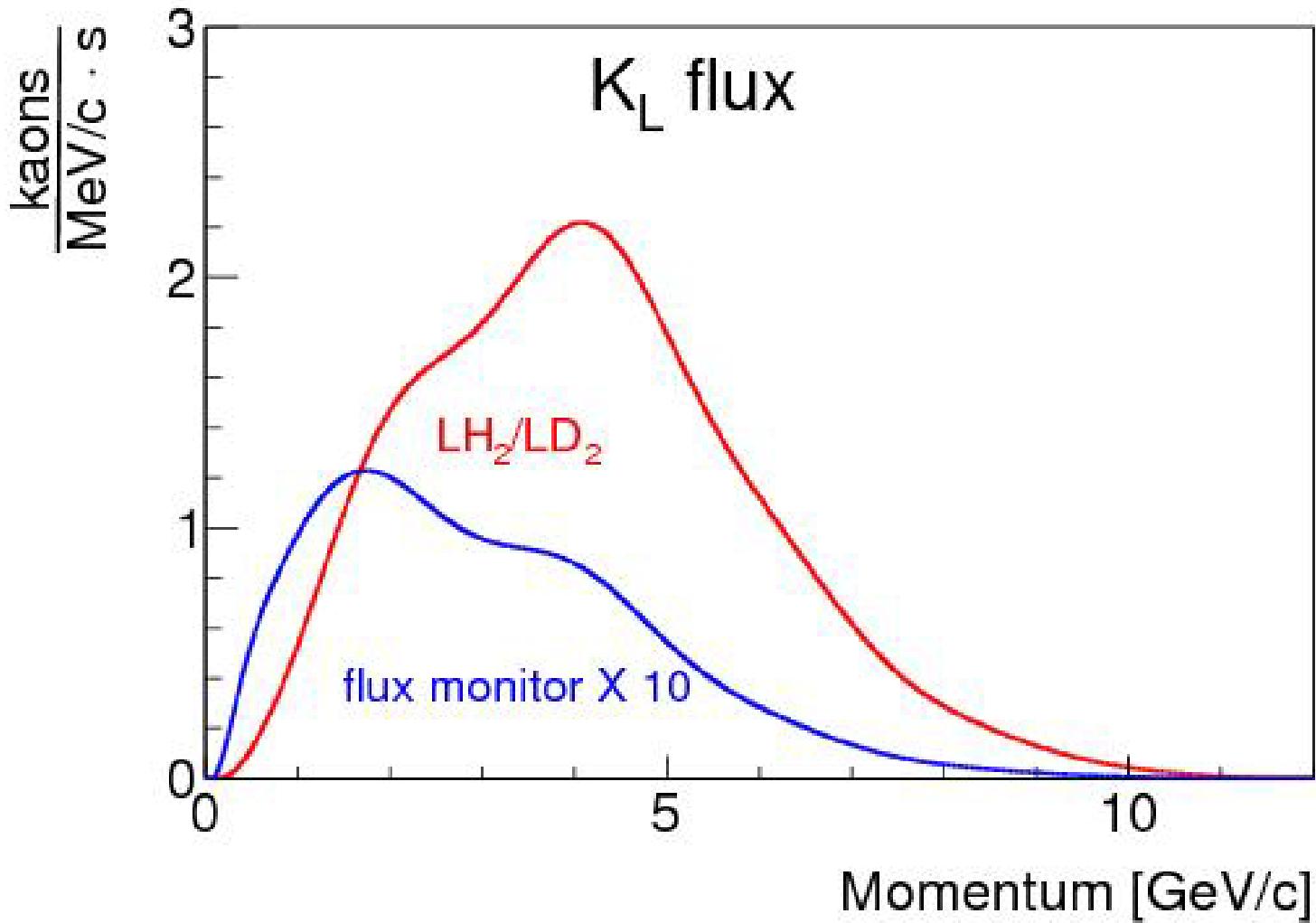
Flux Monitor



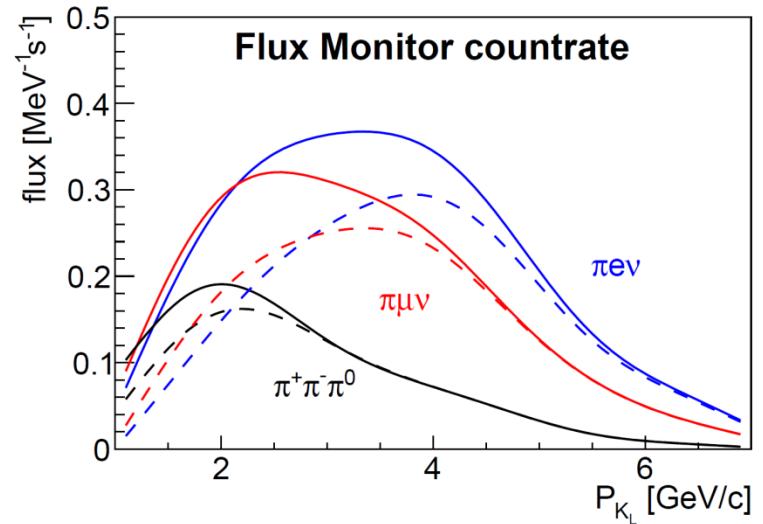
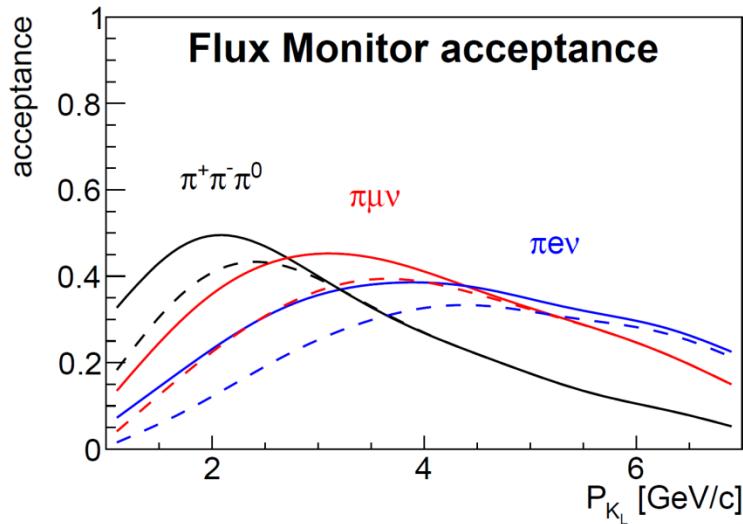


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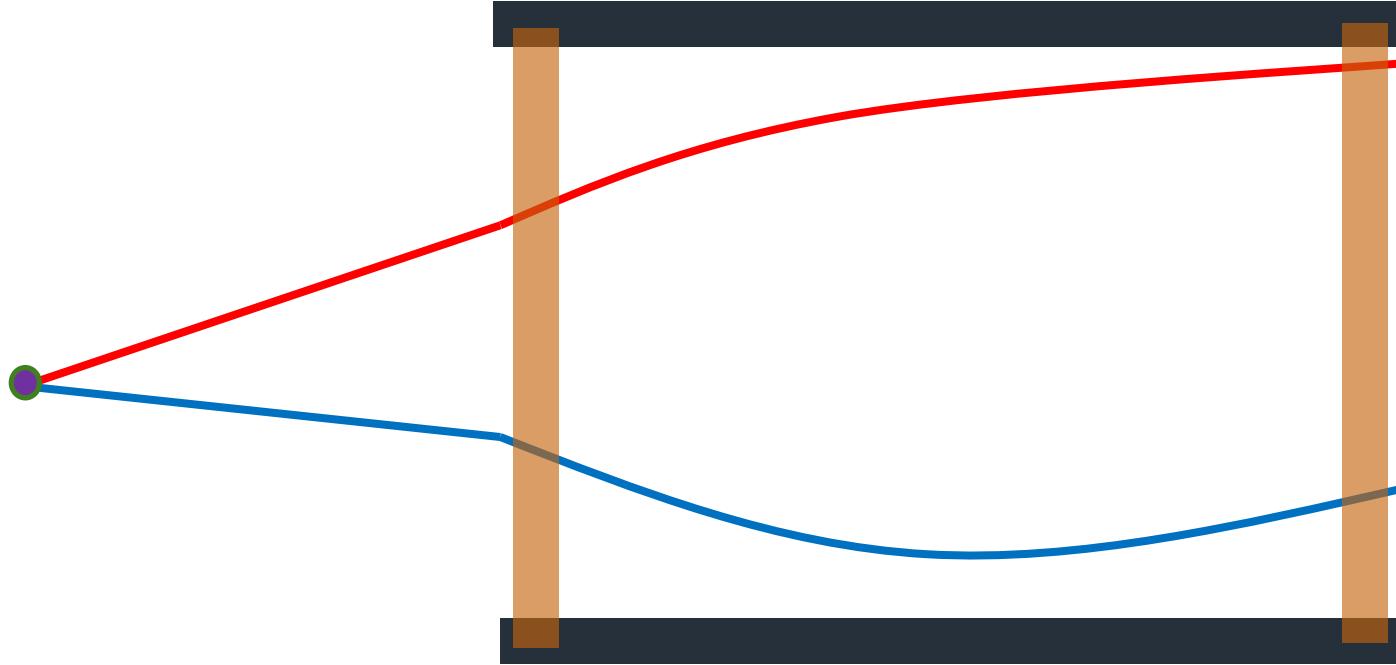
K_L spectrum



K_l in-flight decay



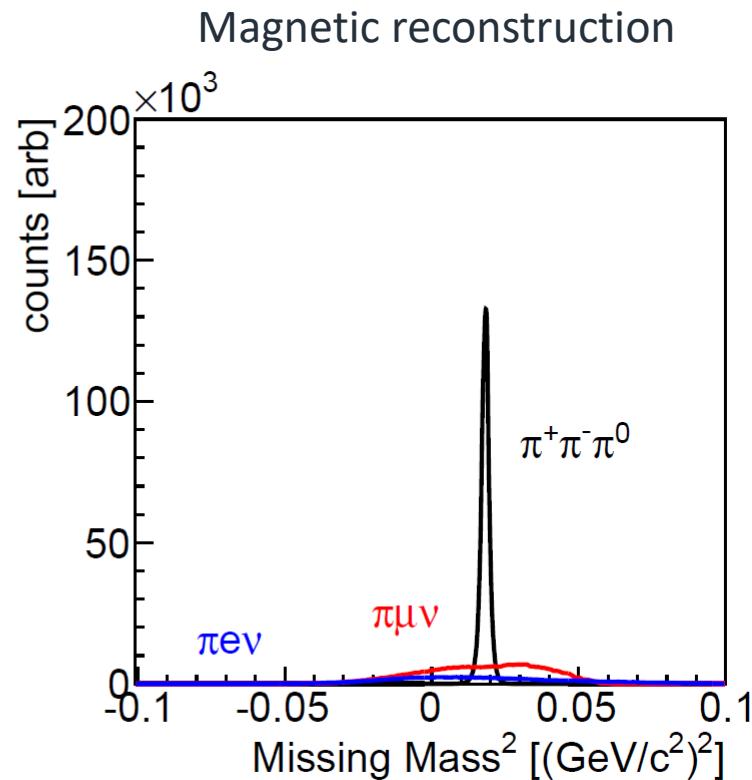
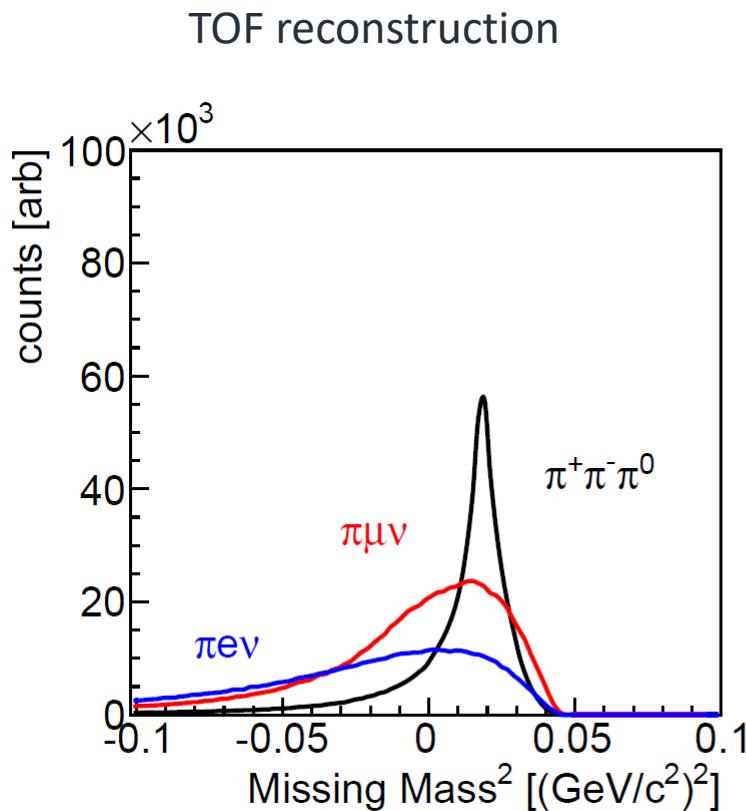
Phi displacement



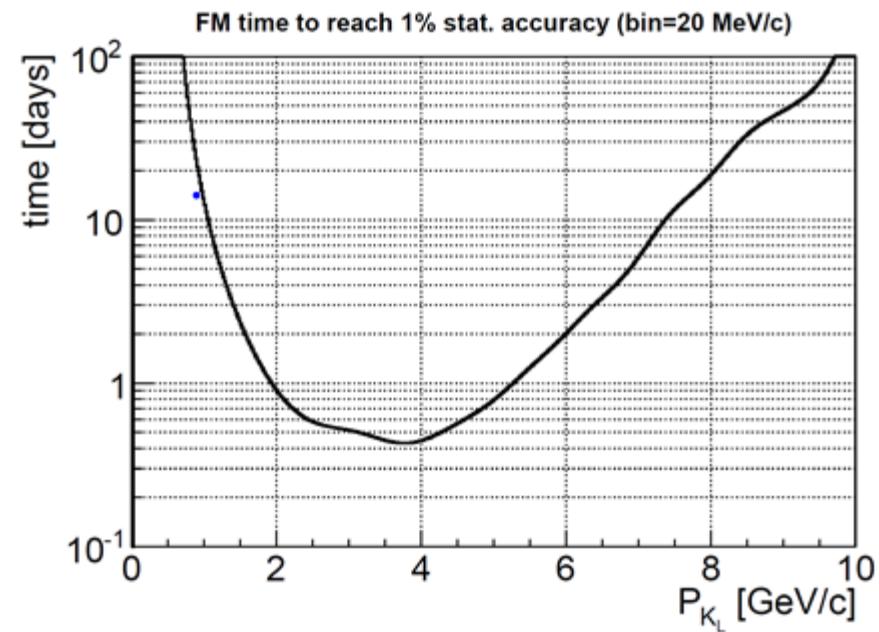
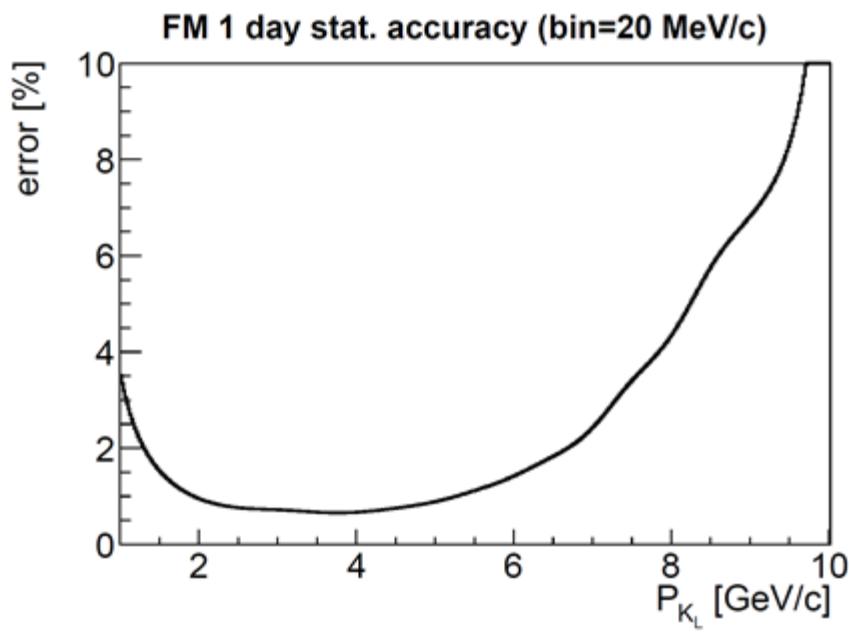
$$\phi' = 0.5 \frac{l \cdot z \cdot 0.3 \cdot B}{p \cdot \cos(\Theta)}; l \sim 1m, |z| = 1; B = 1;$$

$$\phi' [rad] = \frac{0.15}{p [GeV/c] \cdot \cos(\Theta)}$$

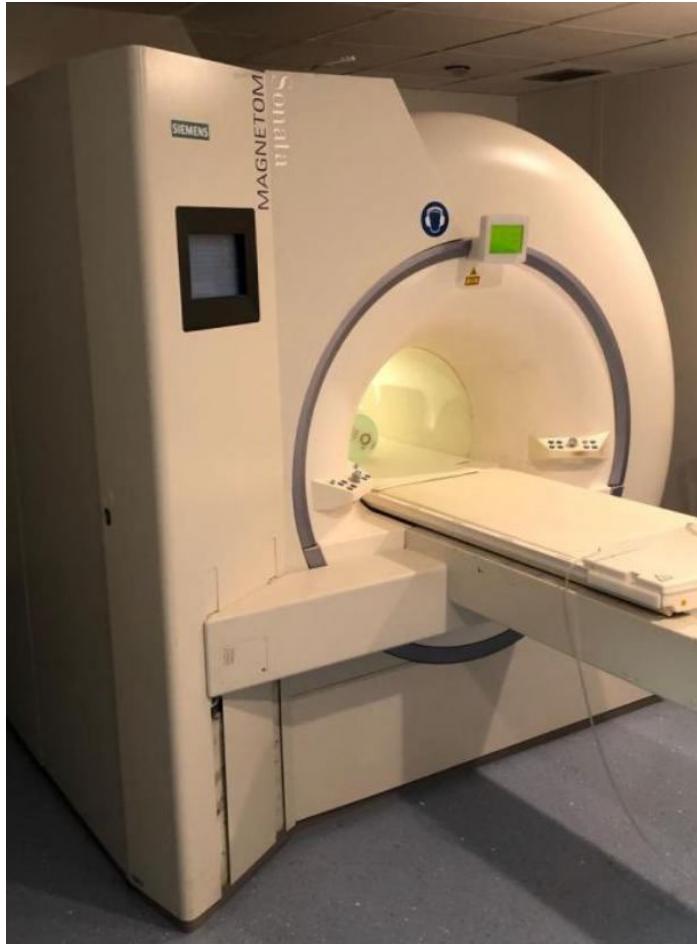
K_l FM resolution



Expected stat accuracy



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

Other possible options

- No-magnet FM
 - cheap,
 - 2x less trackers
 - Background discrimination?
- KL in flight decay in front of the LH/LD target measured with GlueX?
 - Systematics?

To do

- Simulations of “other” designs
- Construction of ToF prototypes (achievable ToF resolution)

Conclusion

