

# Hypernuclear Experiment at Hall C

*Kyoto University*

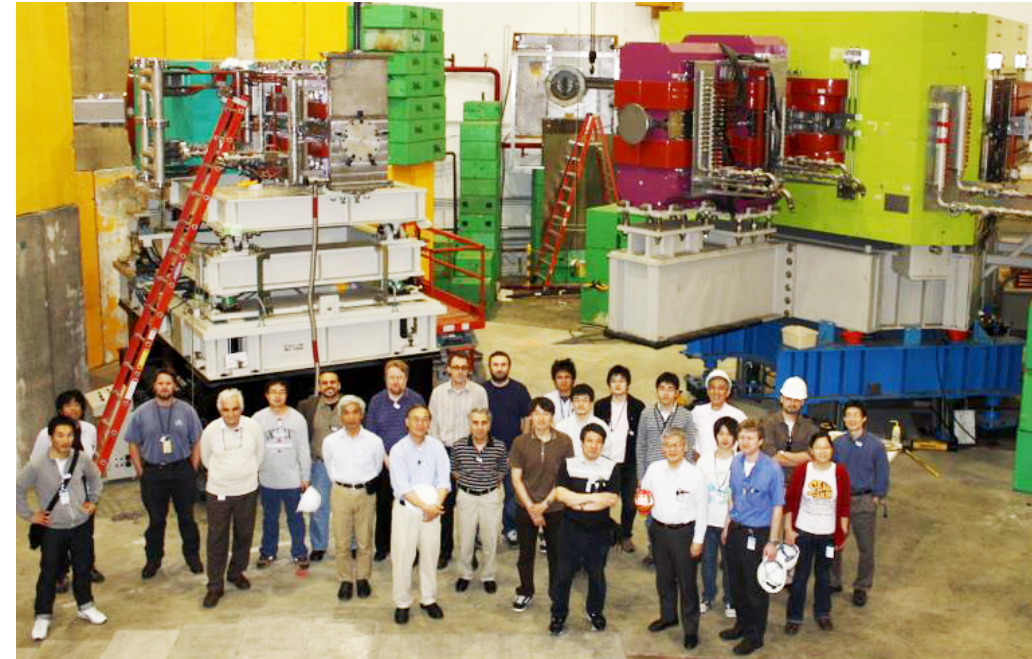
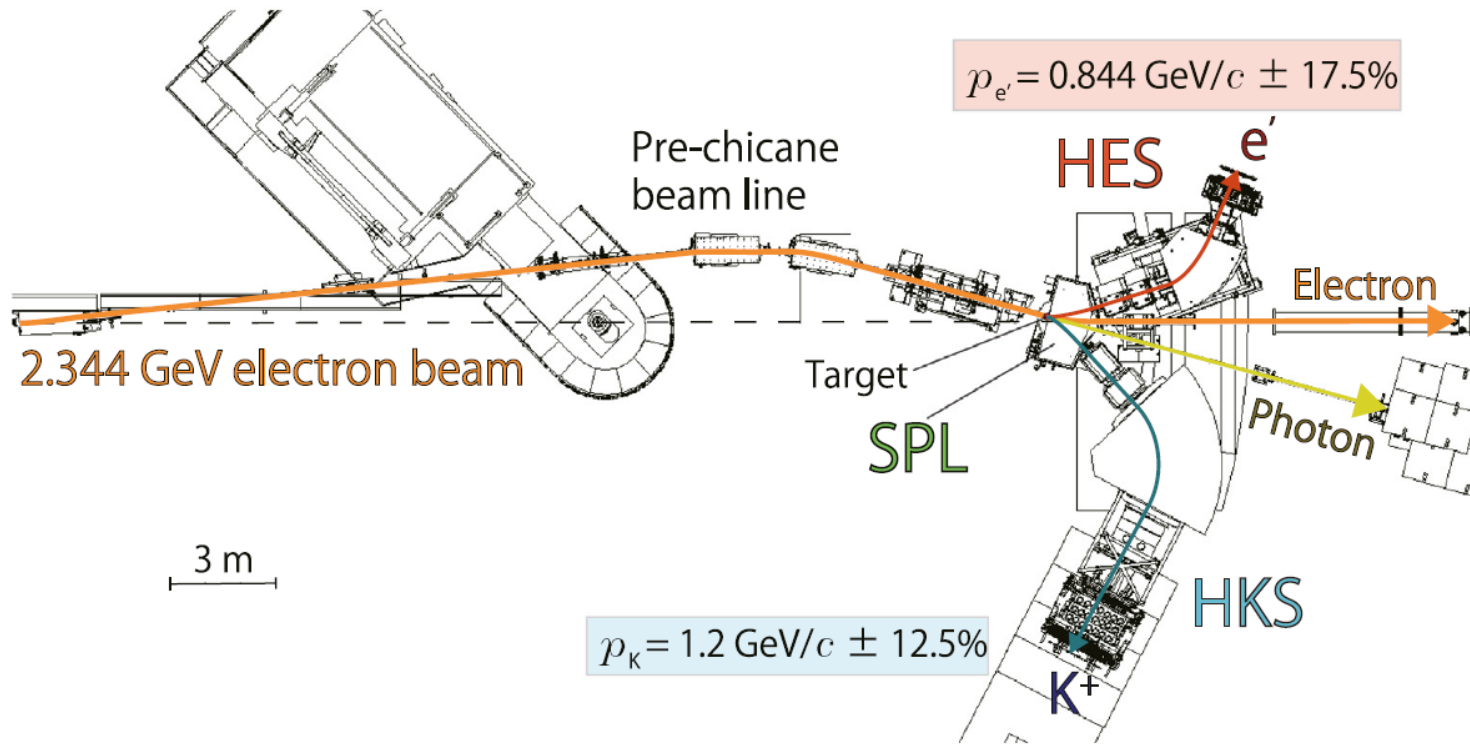
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# SPL+HES+HKS (E05-115) at Hall C



- TG et al., PRC 103, L041301 (2021).
- TG et al., NIMA 900, 69—83 (2018).
- TG et al., PRC 94, 021302(R) (2016).
- TG et al., PRC 93, 034314 (2016).
- Y. Fujii et al., NIMA 795, 351—363 (2015).
- L. Tang et al., PRC 90, 034320 (2014).
- TG et al., NIMA 729, 816—824 (2013).

# Issue to solve in HKS

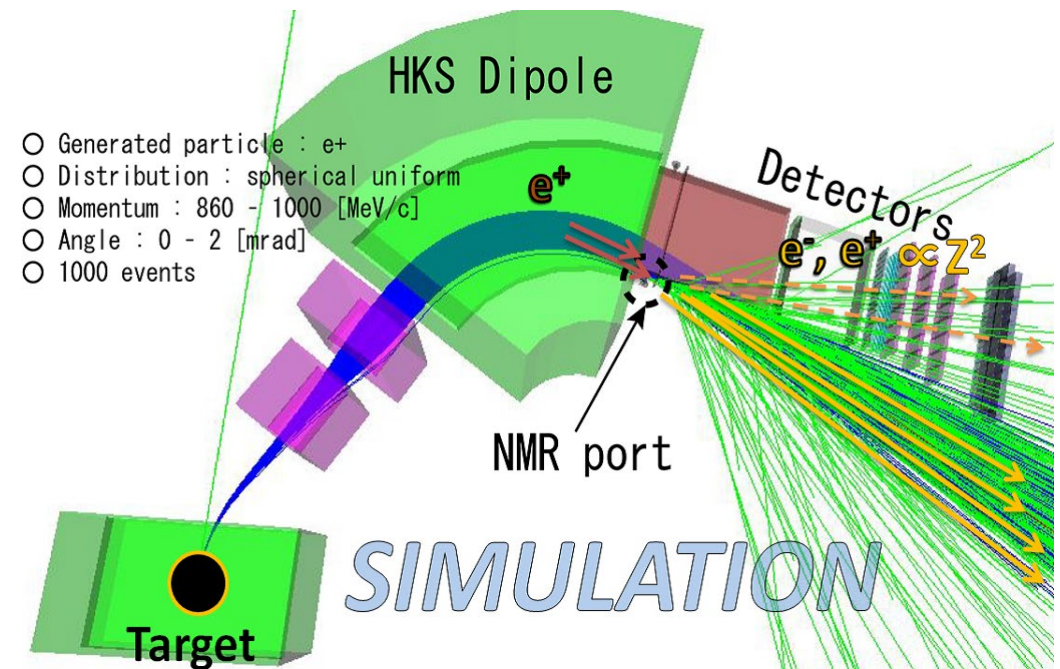
Ref.) TG et al., NIMA 900, 69—83 (2018)

## $e^+/e^-$ backgrounds generated at HKS-D exit

- High accidental coincidence rate
  - Beam intensity was limited particularly for a large Z target
  - S/N was bad in resulting spectra

## Possible solutions:

1. Introduction of septum magnet
2. Changing to a lighter material for the lower momentum side of the HKS-D vacuum extension (or VE  $\rightarrow$  He bag)
3. Changing to the vertical bending  
← The need of massive modification (Base for HKS magnets, frames for detectors etc.)



# To use gas targets

- Reaction-position information would need to be measured by a vertical bending magnet at least because a point production cannot be assumed for a long  $z$  target.
  - ✓ Previous configuration of HES-HKS is not suitable
  - ✓ SHMS for  $e'$  ?

# Summary table (yield and resolution)

D0	e' ( $\theta$ 、 $\Omega$ 、dp)	K <sup>+</sup> ( $\theta_{\gamma K}$ 、 $\Omega$ 、 $f_K$ )	$\Gamma$ (/10 <sup>-5</sup> )	$\Delta E_{\Lambda}$ FWHM (/ MeV)	Yield per hour <sup>12</sup> C, 0.1 g/cm <sup>2</sup> , 100 nb/sr, 30 $\mu$ A
SPL	HES (5°、7 msr、17.5%)	HKS (7°、8 msr、0.3)	5.7	0.4 + opt.	32
PCS	HES (6°、5 msr、17.5%)	HKS (0°、7 msr、0.25)	2.8		12
PCS	SHMS (6°、1.5 msr、40%)	HKS (0°、7 msr、0.25)	1.9	0.9 + opt.	8
-	SHMS (6°、2.0 msr、40%)	PCS+HKS (0°、7 msr、0.25)			10

e: 2.344 GeV, e': 0.844 GeV/c, K+: 1.2 GeV/c  
Efficiency = 0.7

# Yield per day @ 20 $\mu$ A

	$^3\text{He}$ 5 nb/sr	$^{12}\text{C}$ 100 nb/sr	$^{40}\text{Ca}$ 10 nb/sr	$^{208}\text{Pb}$ 10 nb/sr
SPL+HES+HKS	102	512	153	3
PCS+HES+HKS	38	192	57	1.1
PCS+HRS+HKS	25	128	38	0.8

# Summary

- **HES+HKS**

- The best option
- HKS needs to be modified (VE modification / VE  $\rightarrow$  He bag)
- To the vertical bending for long z target
- w/ PCS  $\rightarrow$  S/N (could be)  $\uparrow$ 、 yield  $\downarrow$

- **PCS+SHMS+HKS (VE modification)**

$\rightarrow$  Might be similar quality of data to that of the Hall A experiment





