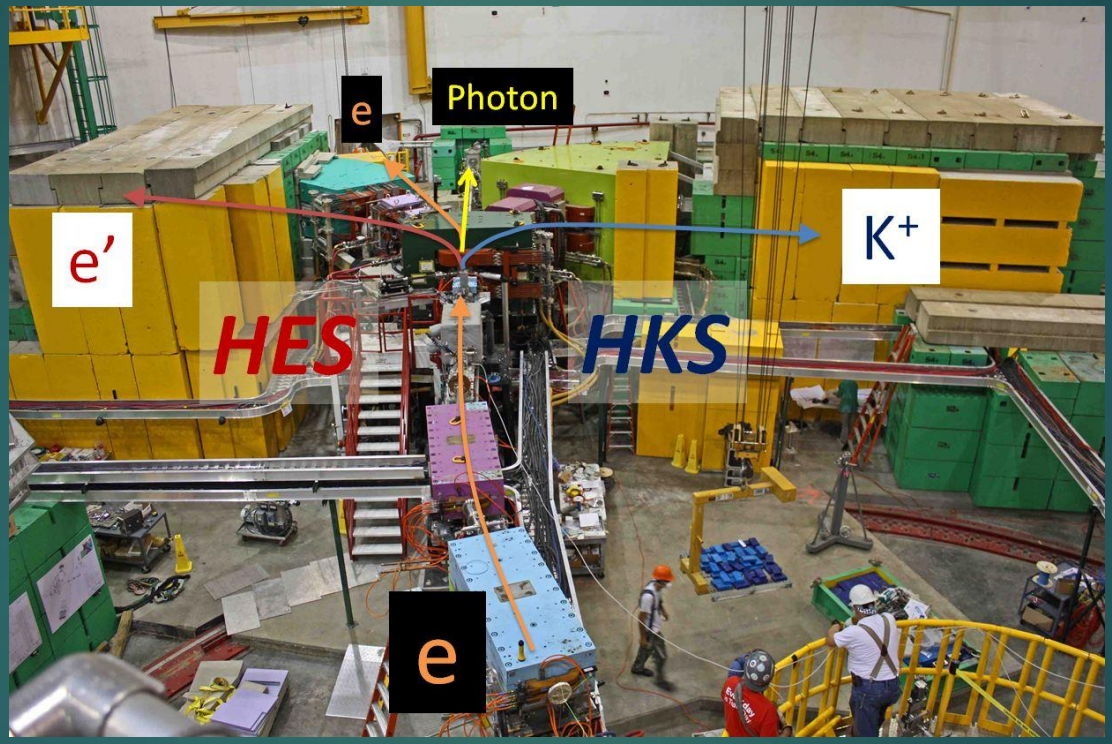
Overview and what to be discussed



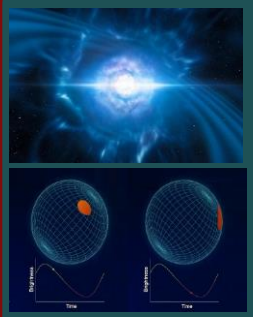
HKS + HES + SPL @JLab Hall-C (2009)

S.N.Nakamura @ Univ. of Tokyo

14 Nov. 2023, Jefferson Lab

Problems we are challenging now

Recent astronomical observations



Hypertriton Puzzle

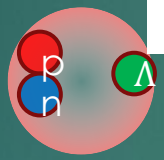
MAMI

Shallow bound
Short lifetime

JLab E12-19-002

J-PARC

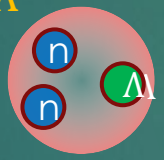
ELPH



$^{3}_{\Lambda}n$ Puzzle

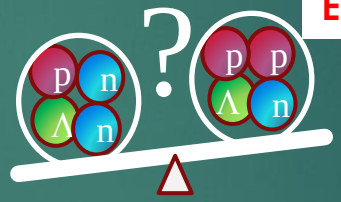
GSI

Bound?
Resonance?
Not Exist?



JLab E12-17-003

CSB of Λ Hypernuclei



Hyperon Puzzle

JLab E12-15-008 E12-20-013

Why massive NS exists?

A=3

10^{-15} m

$A\sim10^{57}$

10^{4} m

J-PARC HIHR

Hypernuclear experiments at JLab

E89-009 (2000) : Existing spectrometers, SOS + Enge

Proof of Principle

HNSS

Hall-C

Hall-A Hypernucl.

E01-011 (2005) : HKS

Construction of HKS, Tilt Method

Λ, Σ^0, $^{7}_{\Lambda}$He, $^{12}_{\Lambda}$B, $^{28}_{\Lambda}$Al

Light Hypernuclei

E94-107 (2004-5)

Two HRSs + SC Septum

Λ, Σ^0, $^{9}_{\Lambda}$Li, $^{12}_{\Lambda}$B, $^{16}_{\Lambda}$N

Light Hypernuclei

E05-115 (2009) : **HKS-HES**

HKS+HES, new Chicane beamline, Splitter

Λ, Σ^0, $^{7}_{\Lambda}$He , $^{9}_{\Lambda}$Li, $^{12}_{\Lambda}$B, $^{52}_{\Lambda}$V

Light to medium-heavy Hypernuclei

E12-17-003 (2018) :

HRS+HRS, ^{3}H Target

$nn\Lambda$ study

E12-15-008, E12-20-013, E12-19-002

HKS+HRS +PCS ^{40,48}Ca , ^{208}Pb, ^{3,4}He

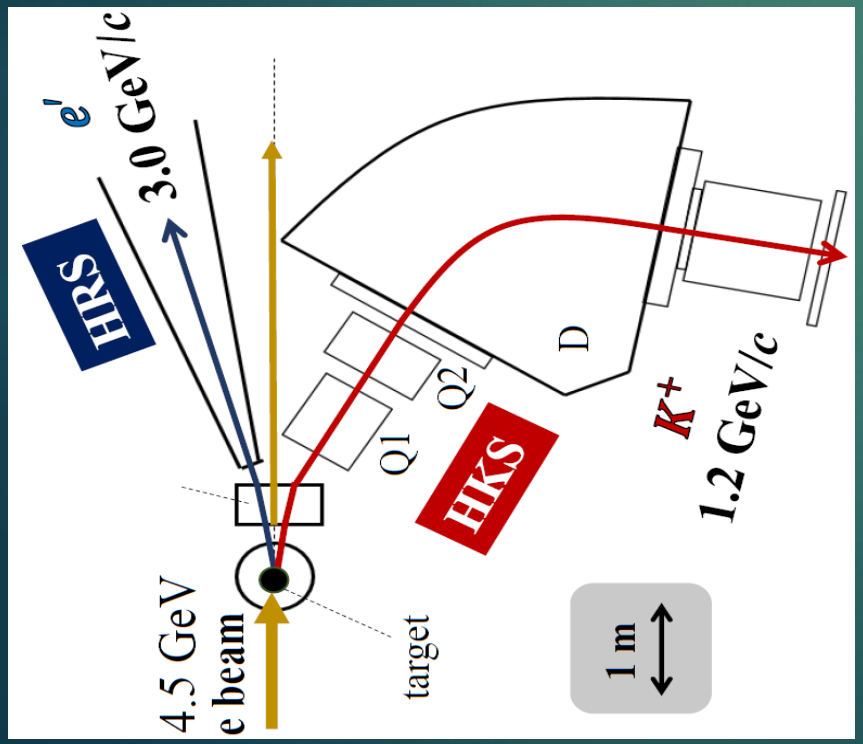
New JLab Hypernuclear Exp. In Hall A

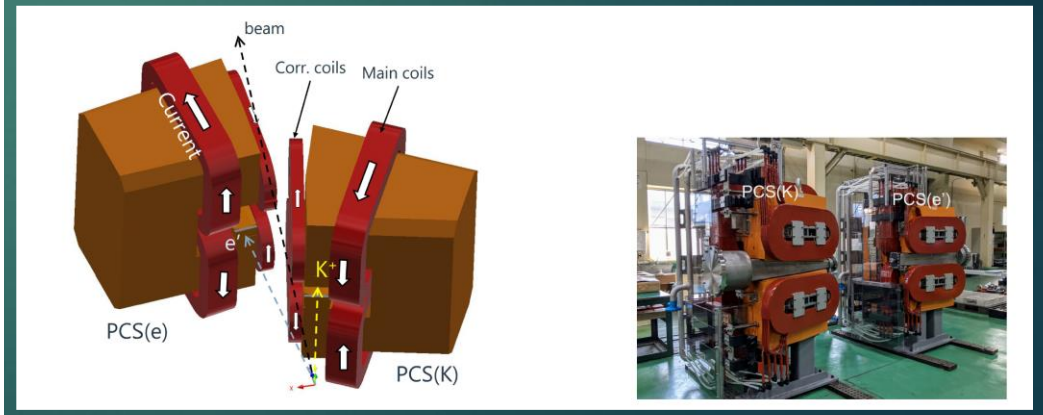
JLab hypernuclear campaign

E12-15-008(^{40,48}Ca), ***E12-20-013*** (^{208}Pb), ***E12-19-002*** (^{3,4}He)

Approved three experiments : HKS + HRS + new PCS in **Hall-A**
Higher beam $E_e = 4.5$ GeV, $E'_e = 3.0$ GeV, Vertical bending HRS

Better S/N



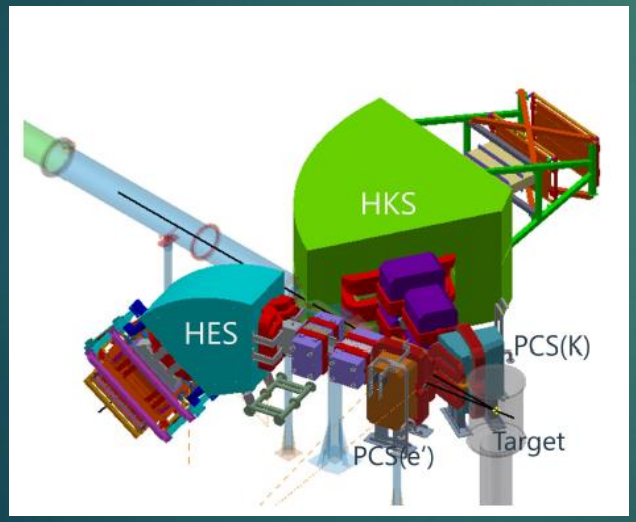


JLab hypernuclear campaign

E12-15-008(^{40,48}Ca), ***E12-20-013*** (^{208}Pb), ***E12-19-002*** (^{3,4}He)

Now we decided to move experiments to Hall-C due to beam availability

E12-15-008(^{40,48}Ca), ***E12-20-013*** (^{208}Pb) ***Possible with HKS+ HES+ PCS (w/o vertical bending Spectrometer)***



E12-19-002 (^{3,4}He) needs vertical bending spectrometer.

Decided to use **simpler configuration for the next campaign** and Experiments with cryogenic targets : after the first campaign

Campaign in 2026

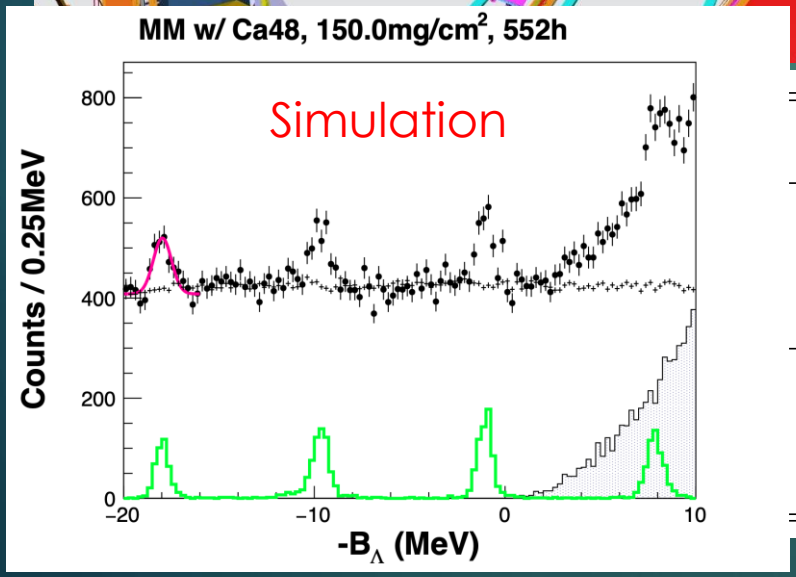
Already used in E05-115

Horizontal HKS

Horizontal HES

New

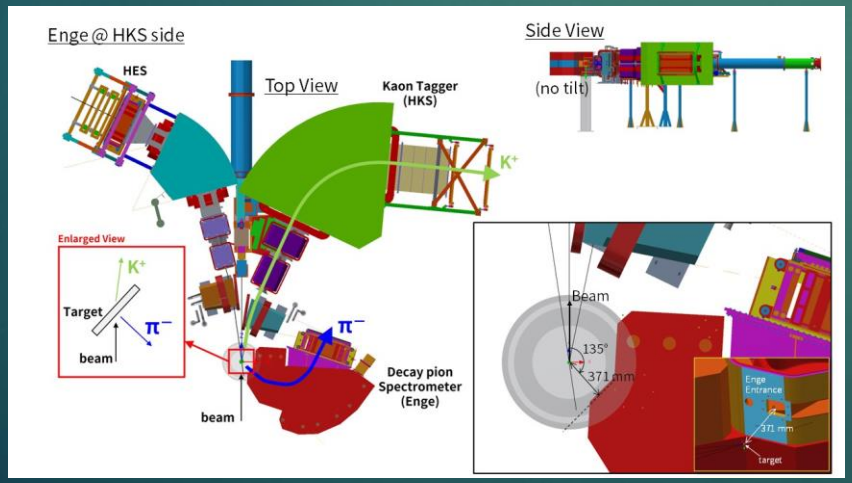
PCS replaces SPL



Beam	Energy E_e [/(GeV)]	2.240
	Energy stability $\Delta E_e/E_e$	3×10^{-5}
PCS + HES	Central momentum P_e [/(GeV/c)]	0.744
	Central angle $\theta_{e,e'}$ [/(deg)]	8
	Solid angle $\Delta\Omega_{e'}$ [/(msr)]	3.4
	Momentum resolution $\Delta P_{e'}/P_{e'}$	4.4×10^{-4}
PCS + HKS	Central momentum P_K [/(GeV/c)]	1.200
	Central angle θ_K [/(deg)]	15
	Solid angle $\Delta\Omega_K$ [/(msr)]	8.3
	Momentum resolution $\Delta P_K/P_K$	2.9×10^{-4}

Hypernuclear Campaign 2026

Exp.6	Targets	Req. BT (PAC Day)	Comments
E12-15-008	^{40,48}Ca	28 (61)	Isospin
E12-20-013	^{208}Pb	20 (+?)	Large mass #
LOI12-23-013	^{6}Li, ^{9}Be, ^{11}B	21.5	CSB
LOI12-23-016	^{27}Al	28	Triaxial deform
LOI12-23-011	Decay π	14	Parallel to all BT



All share HKS+HES+PCS

Decay π needs ENGE

What to be discussed

Task breakdown for the coming ERR

We are familiar with HKS, HES and all detectors exist.

New PCS installation, Layout design, installation plan

Targets and target chamber

Necessary resources including Power Supplies

Beamline and beam diagnose, SLI

New DAQ

Radiation budget

Information exchange and plan/schedule for ERR preparation