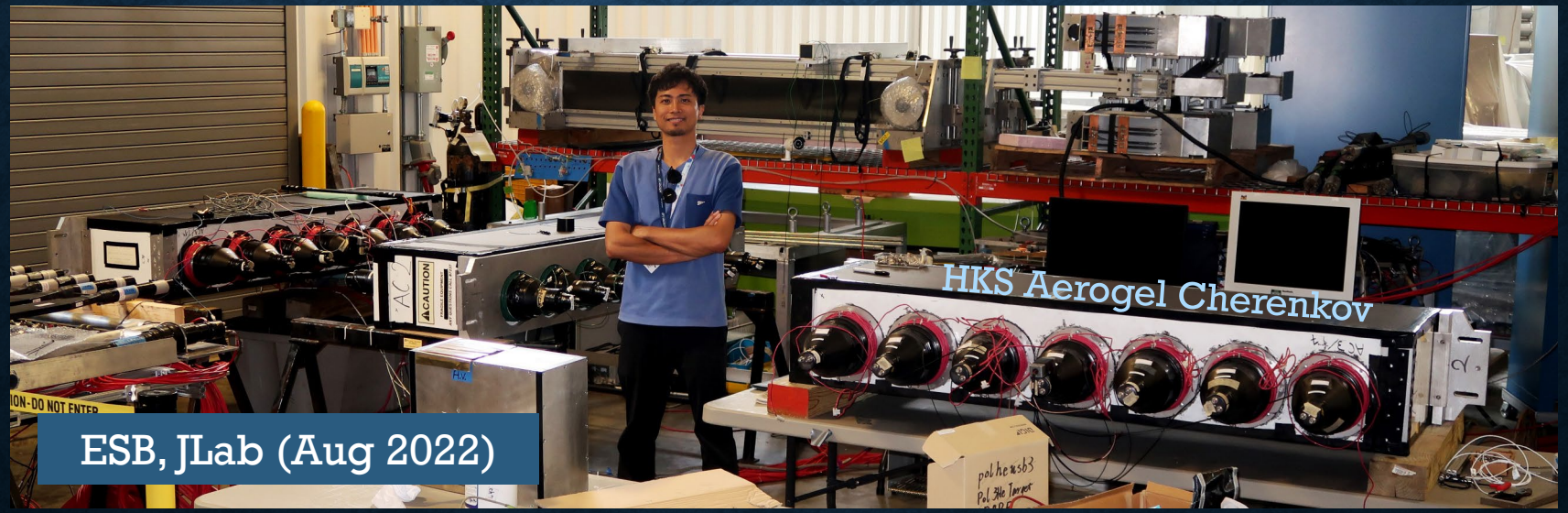
JLab Hypernuclear Collaboration Meeting 2022

Status and activity summary (JLab Hypernuclear Experiment)

Toshiyuki Gogami (Kyoto University)

GRADUATE SCHOOL OF SCIENCE FACULTY OF SCIENCE KYOTO UNIVERSITY

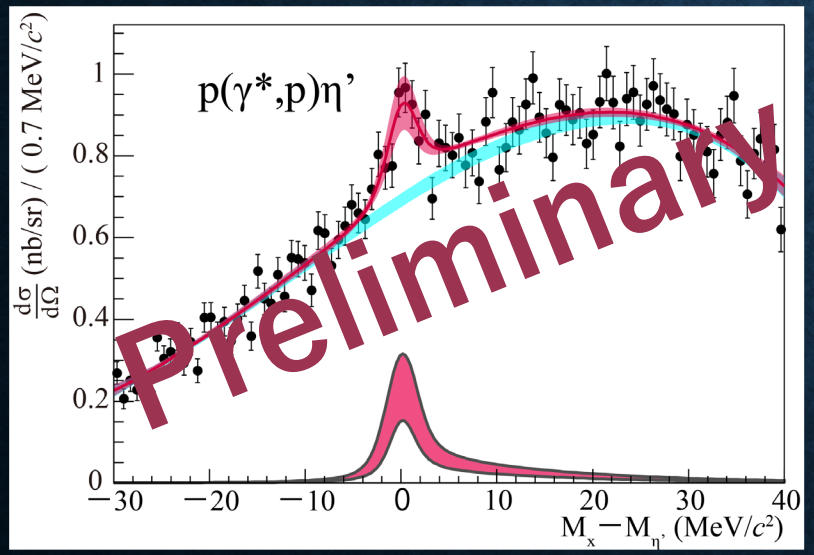
December 12, 2022



What to show / to be discussed in the meeting

On-going DATA analysis

- Λ / Σ^0 production → Okuyama
- η' production → Akiyama



Preparation for the next

- Possible schedule → Today
- New magnets PCS → Sho (today)
- Optics optimization / MC simulations → Ishige
- Detector commissioning → AC: Bishnu
- Pb target experiment → Guido

← Discussion about Target

Results of the nn Λ search experiment

E12-17-003 (Hall A, 2018)

https://www.kyoto-u.ac.jp/ja/research-news/2022-03-08

- K. N. Suzuki et al., PTEP 2022, 013D01 (2022)
- B. Pandey et al., PRC 105, L051001 (2022)

$^3\mathrm{H}(e,e'p)nn\eta'$ spectrum

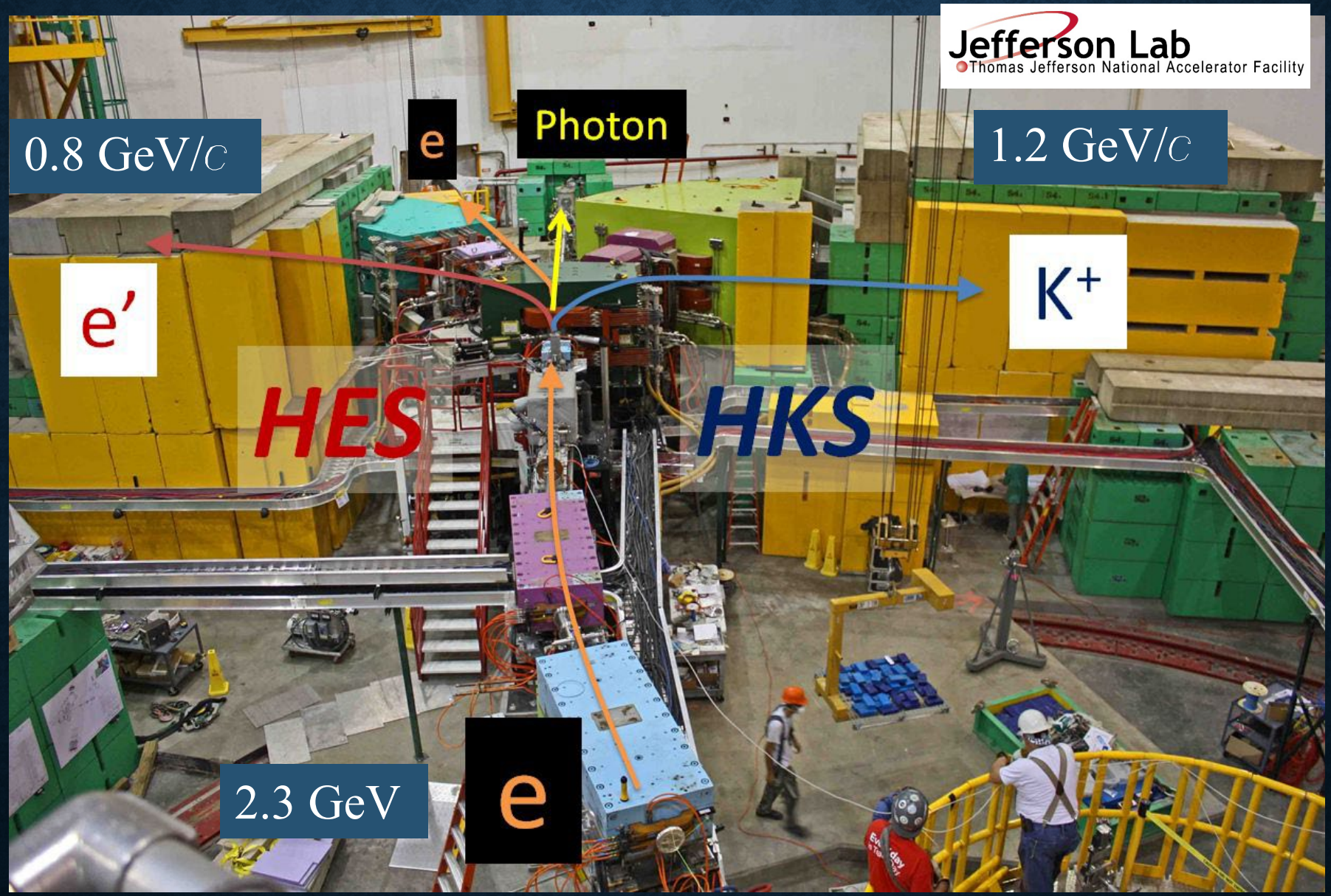
$$B_{\eta'} = M_{\eta'} + M_{\mathrm{core}} - M_x$$

Upper limit (C.M. sys., 90% C.L.)

➔ η 'N interaction

Discussion with theorists is in progress

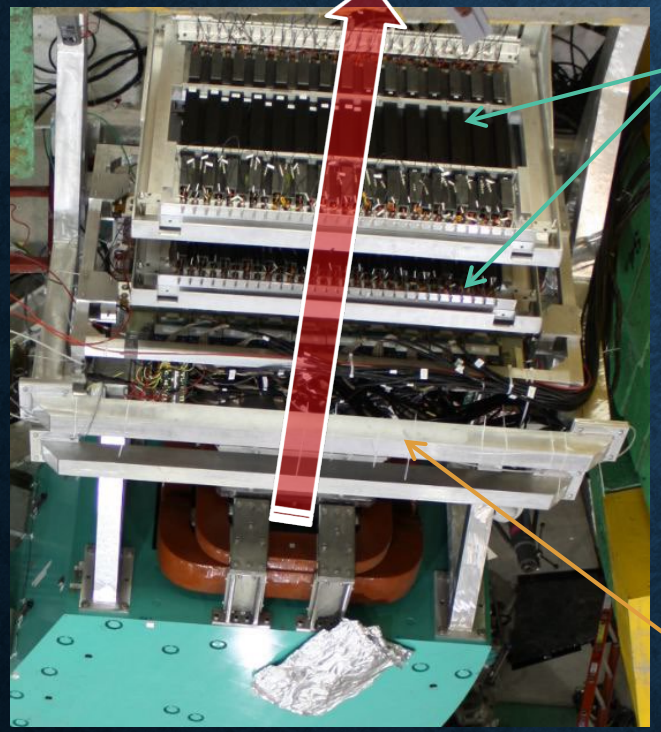
Experimental setup for E05-115 (2009) at JLab Hall C



PARTICLE DETECTORS

HES

e^-



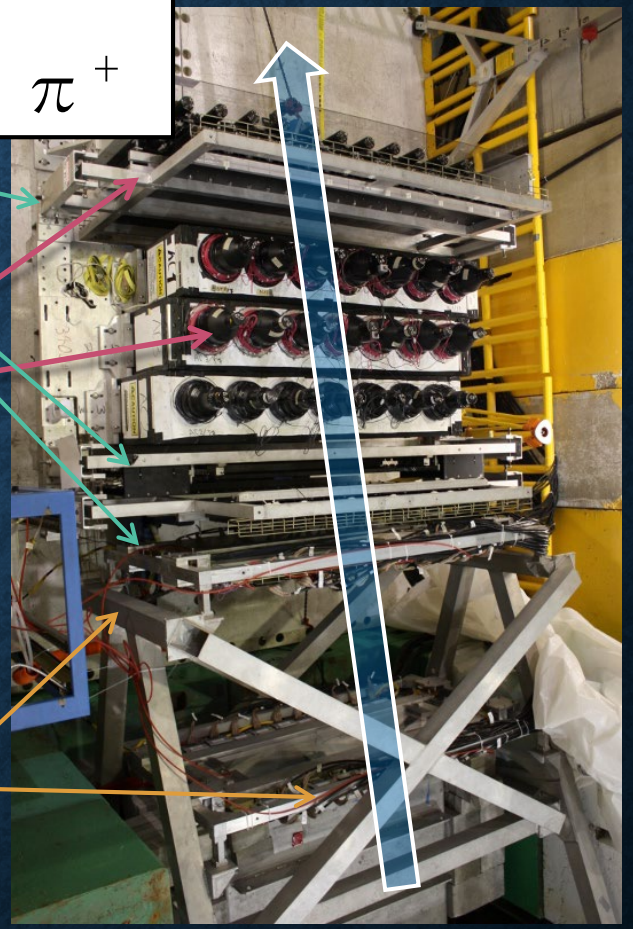
TOF walls
(Plastic scintillators)

Cherenkov detectors
- Aerogel (n=1.05)
- Water (n=1.33)

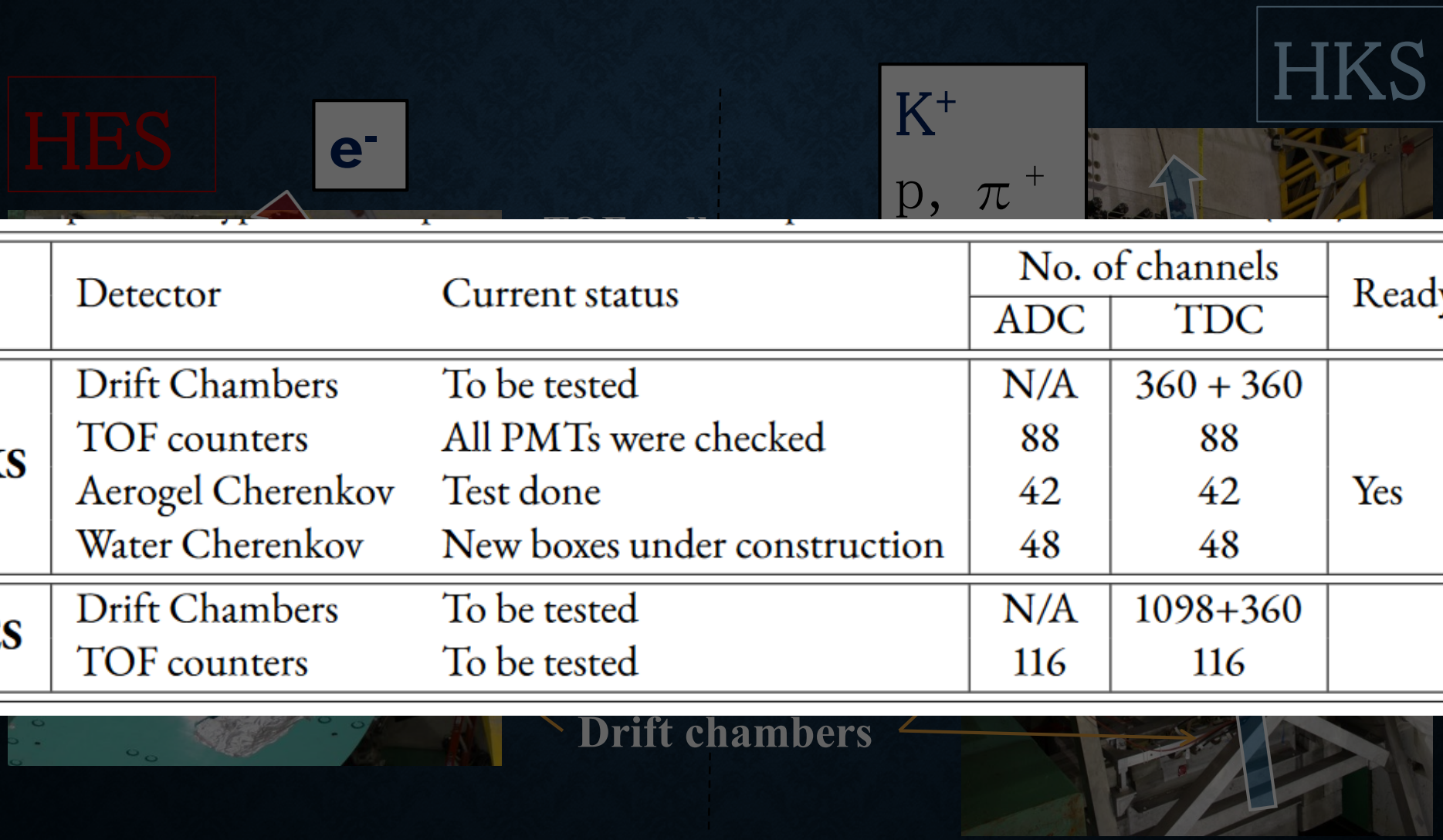
Drift chambers

HKS

K^+
p, π^+



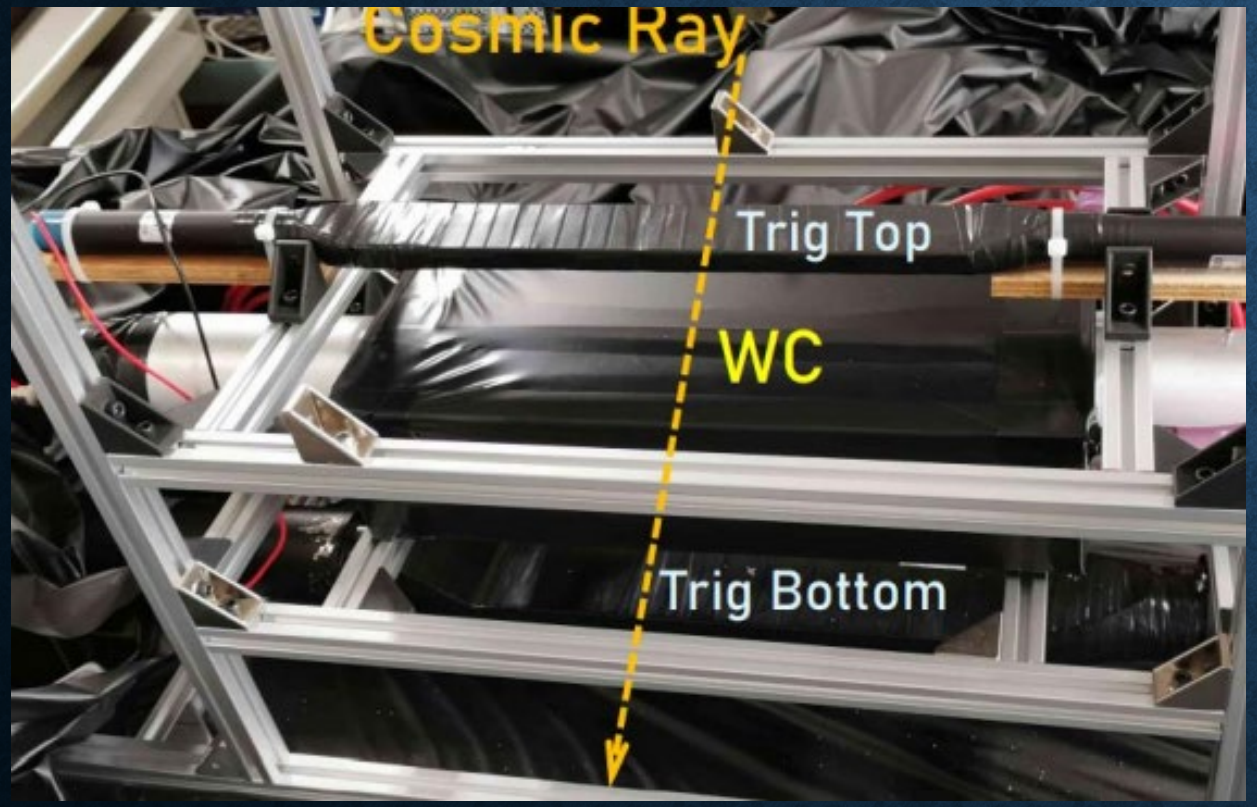
PARTICLE DETECTORS

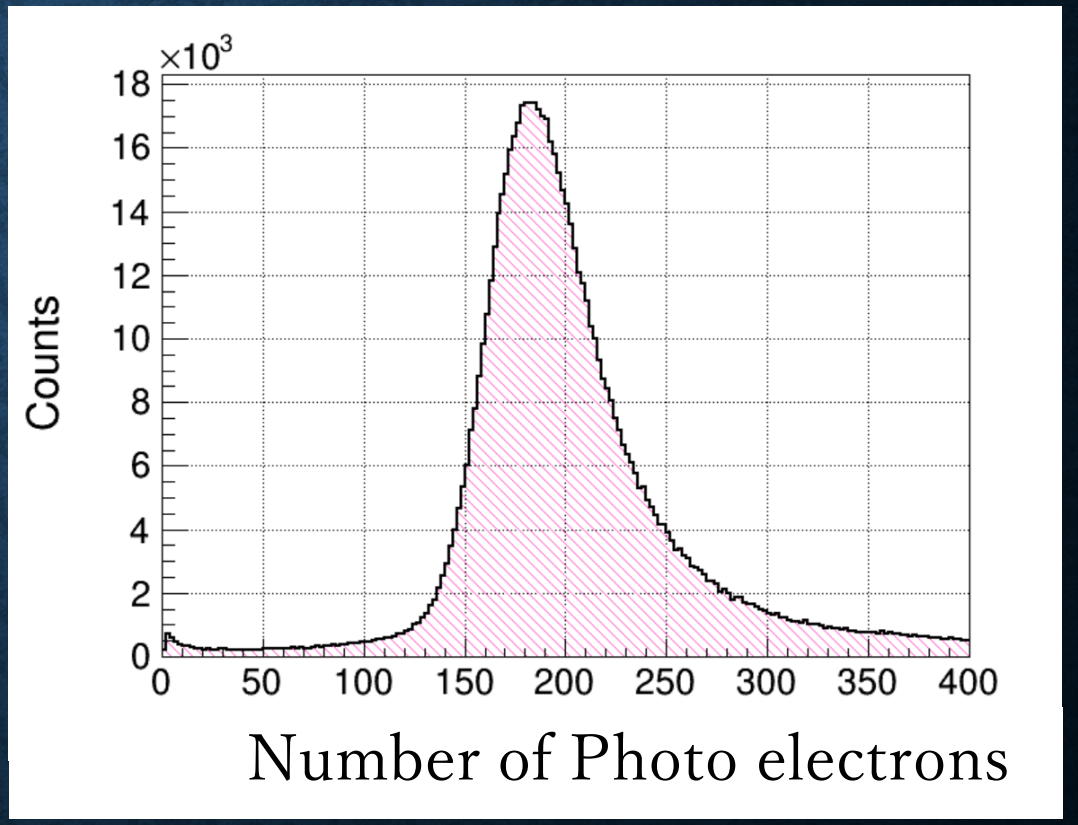


	Detector	Current status	No. of channels		Ready?
			ADC	TDC	
HKS	Drift Chambers	To be tested	N/A	360 + 360	
	TOF counters	All PMTs were checked	88	88	
	Aerogel Cherenkov	Test done	42	42	Yes
	Water Cherenkov	New boxes under construction	48	48	
HES	Drift Chambers	To be tested	N/A	1098+360	
	TOF counters	To be tested	116	116	

NEW WATER CHERENKOV COUNTERS

Figures from Mr. Nagano (Tohoku Univ.)





- Better PID power than previous WC
- 11 out of 24 boxes were already constructed in Tohoku Univ.

RECENT PUBLICATIONS / GRANT-IN-AID

In addition to
https://wiki.jlab.org/tegwiki/images/4/4a/Activity_JLabHypernuclear_20220722_gogami.pdf
(https://wiki.jlab.org/tegwiki/index.php/Hypernuclear_CollaborationMeeting_2022Aug)

Publications (proceedings of HYP2022)

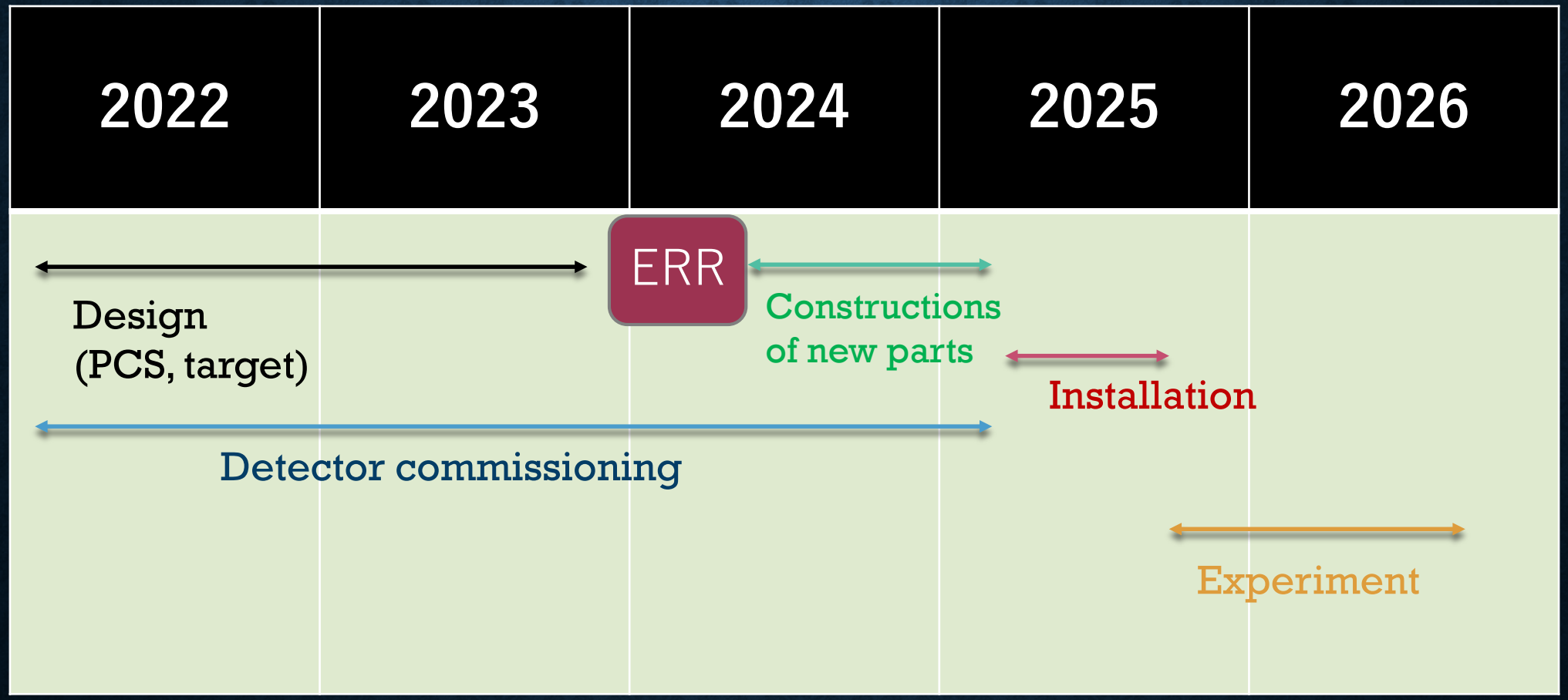
- K. Okuyama et al., EPJ Web Conf. 271, 02003 (2022)
- K. Itabashi et al., EPJ Web Conf. 271, 02006 (2022)
- F. Garibaldi et al., EPJ Web Conf. 271, 01007 (2022)
- S.N. Nakamura et al., EPJ Web Conf. 271, 11003 (2022)
- T. Gogami et al., EPJ Web Conf. 271, 02002 (2022)
- T. Gogami et al., EPJ Web Conf. 271, 01001 (2022)

Grant-in-aid (Fund for the Promotion of Joint International Research (Fostering Joint International Research (B)))

- JFY2022—2026
- Project number: 22KK0040
- Project name: The world's best-accurate spectroscopy of hypernuclei by electron beam
- PI: T. Gogami (CI: S.N. Nakamura, S. Nagao, M. Isaka, Y. Fujii)
- Cost: 15,400,000 JPY (direct cost)

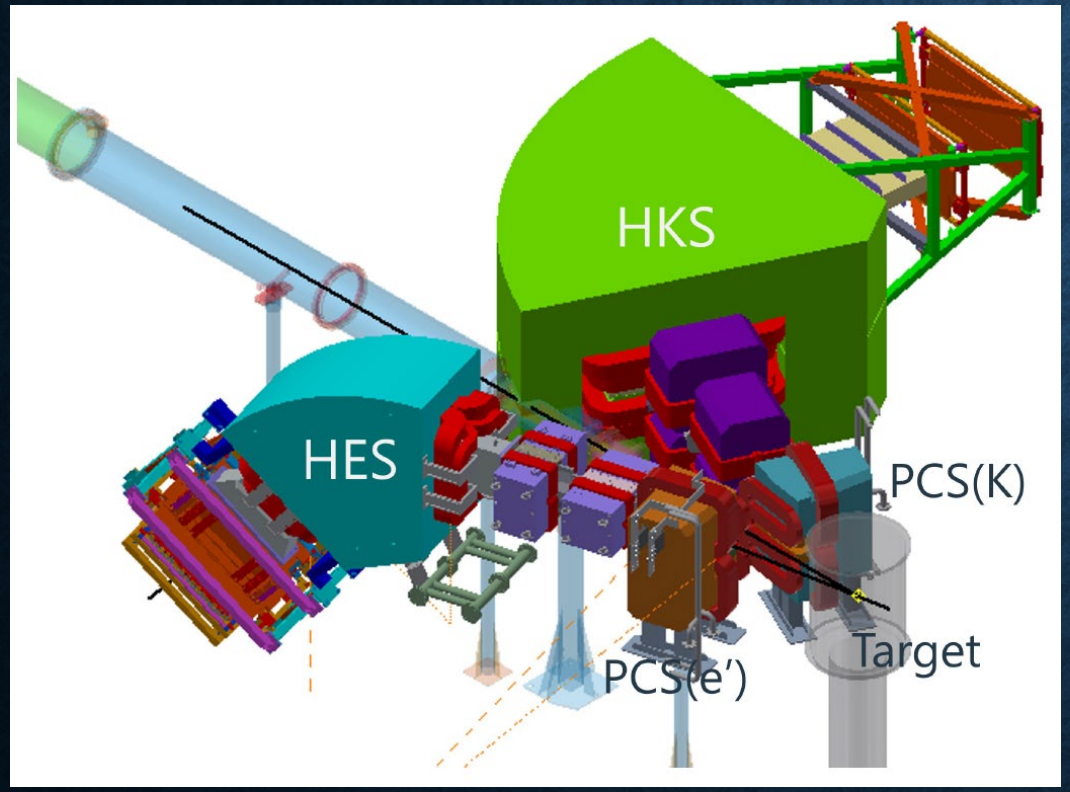
Plan (based on the previous discussion)

https://wiki.jlab.org/tegwiki/index.php/Hypernuclear_CollaborationMeeting_2022Aug



BEAM TIME ESTIMATION

https://wiki.jlab.org/tegwiki/images/7/7f/JLab_Hypernuclear_Request2022.pdf



Experiment	Target (thickness /[mg/cm^2])	Beam time (/hours)	Beam current (/μA)	Remarks
E12-19-002	H gas (54) + cell (162)	60	20	calibration
	Multi ^{12}C foils (100 × 3)	100	20	
	Empty cell (162)	12	20	
	^{3}He gas (165) + cell (162)	600	20	physics
	^{4}He gas (228) + cell (162)	120	20	
	Subtotal	892		
E12-15-008	CH_2 (500)	54	2	calibration
	^{6}Li (100)	28	50	
	^{11}B (100)	28	50	
	^{12}C (100)	36	50	
	^{27}Al (100)	80	50	
	^{40}Ca (77.5)	230	50	physics
	^{48}Ca (77.5)	278	50	
	Subtotal	734		
E12-20-013	^{208}Pb (100)	480	25	physics
Total		**2106**		

SUMMARY

- We are preparing the experiment, aiming at
  - ERR at the beginning of 2024
  - Installation in 2025, followed by the beam time

- Let’s discuss a possible schedule in the discussion time