

JLab Hypernuclear Meeting

Graduate School of Science, Kyoto University

Toshiyuki Gogami

Feb 22, 2021



京都大学

KYOTO UNIVERSITY

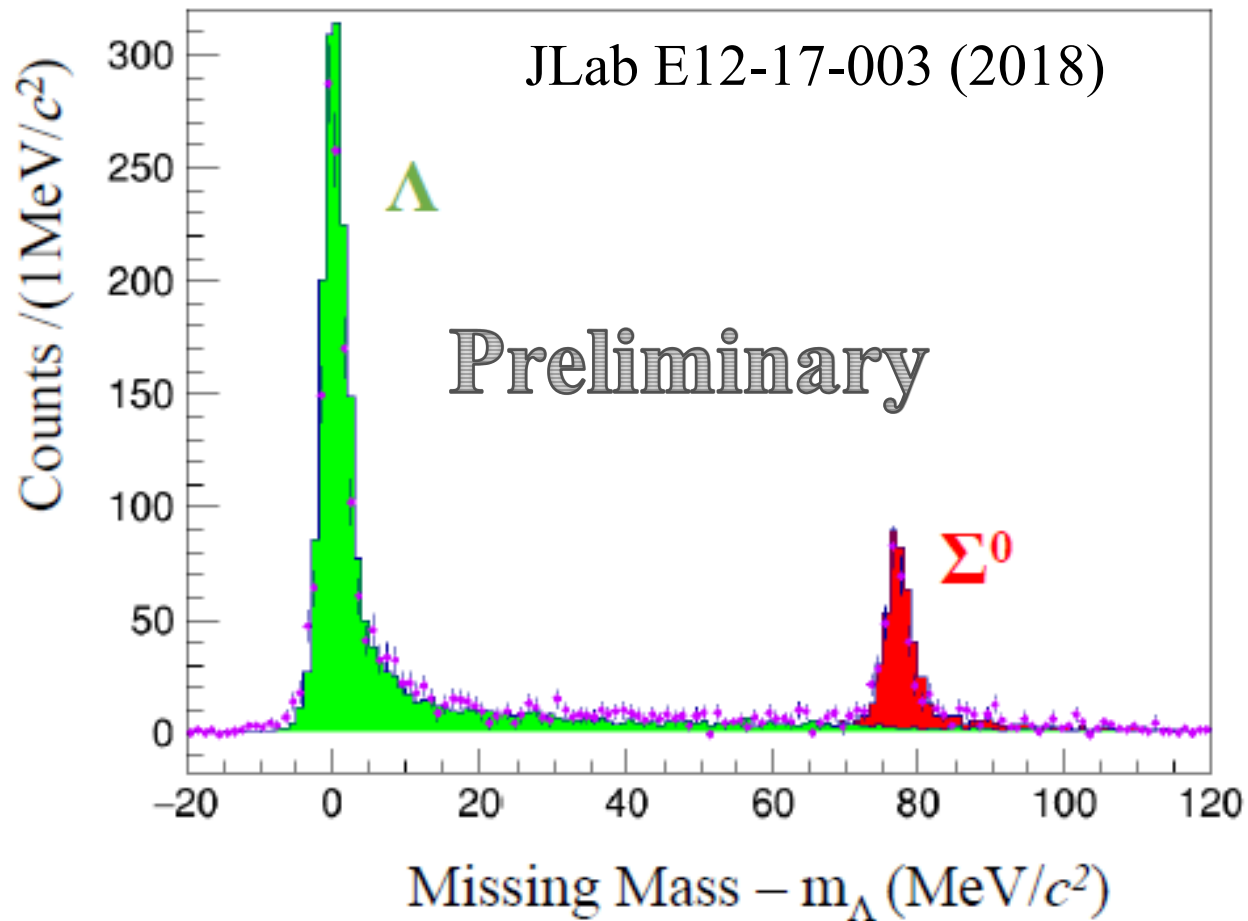
科研費
KAKENHI

SPIRITS
SUPPORTING PROGRAM FOR INTERACTION-BASED
INITIATIVE TEAM STUDIES

Updates (students in Hampton and Kyoto Univs.)

Experiment	Students	Status
E12-17-003	B. Pandey (Hampton)	Ph.D. defense soon ($nn\Lambda$ peak search)
	N. Lashley (Hampton)	Study of EL and MS in target cell w/ Geant4 → He can use the simulator now
	K.N. Suzuki (Kyoto, D2)	He is trying to obtain the cross section for the $nn\Lambda$ production: Almost all efficiencies and factors for the CS derivation were evaluated. He is struggling with an acceptance and its systematic error (this will hopefully be done this month).
	E. Umezaki (Kyoto, D2)	$p(e, e'K^+)\Lambda$, $p(e, e'p)\eta'$, η' mesic nuclear production
Future Experiments	K. Katayama (Kyoto, M2)	“Development of HRS-HKS coincidence trigger with FPGA - Precise Hypernuclear Spectroscopy at JLab -”, Master’s Thesis, Kyoto Univ. (JFY2020). He is going to graduate in March (→ is going to work at KEYENCE from Apr, 2021).
	T. Toyoda (Kyoto, M2)	“Basic design of gas targets for precise hypertriton mass measurement at JLab”, Master’s Thesis, Kyoto Univ. (JFY2020). He is going to graduate in March (→ is going to work at SHARP from Apr, 2021).

Radiation tails in Λ/Σ^0 (E12-17-003)

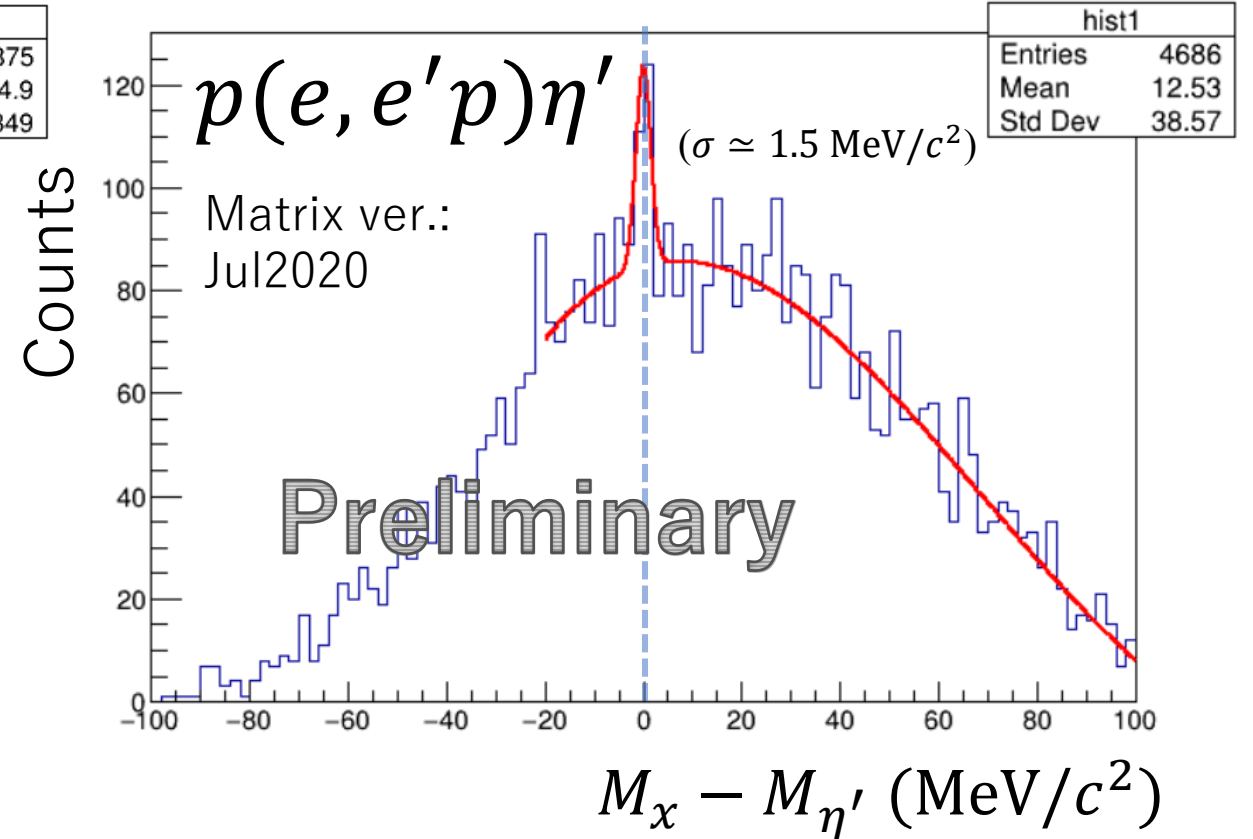
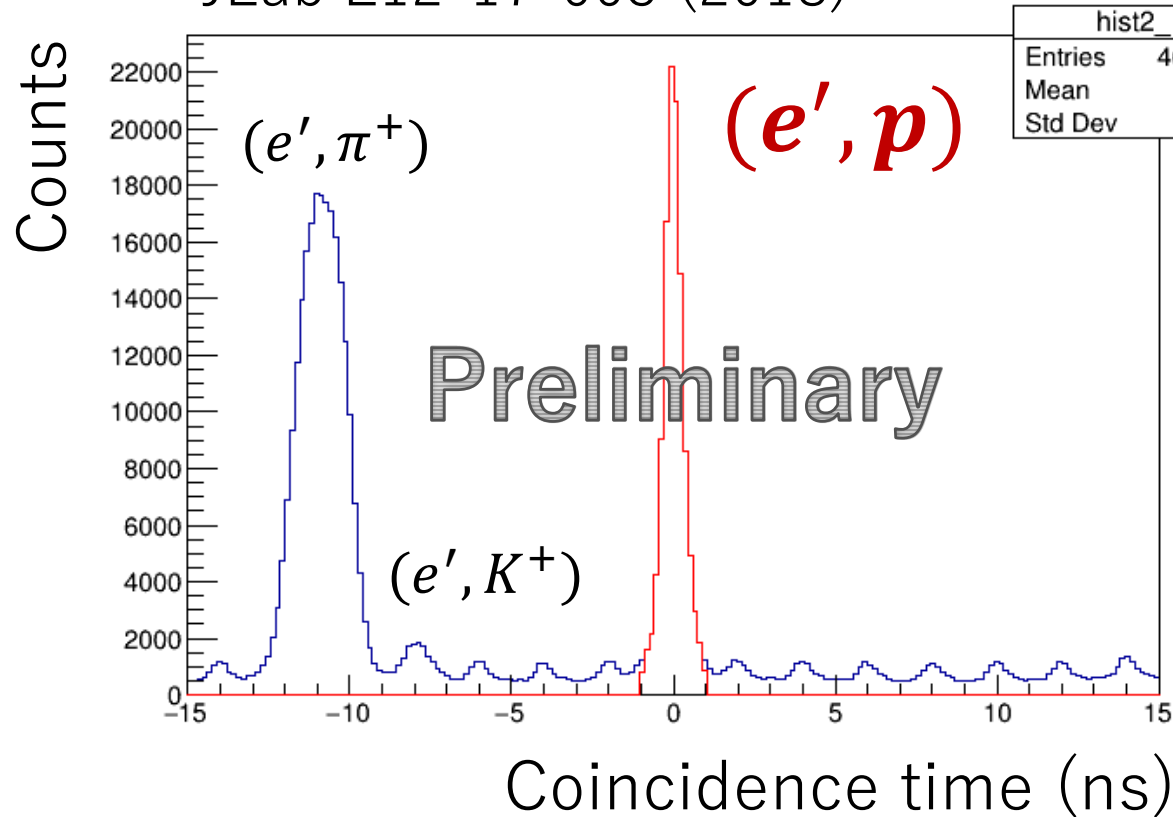


H target with H kinematics
→ Tails are reproduced by Geant4

(Analysis by K.N. Kazuki)

$p(e, e'p)\eta' \rightarrow$ Mesic nuclei ($^{26}\text{Mg} + \eta'$, $nn + \eta'$)

JLab E12-17-003 (2018)



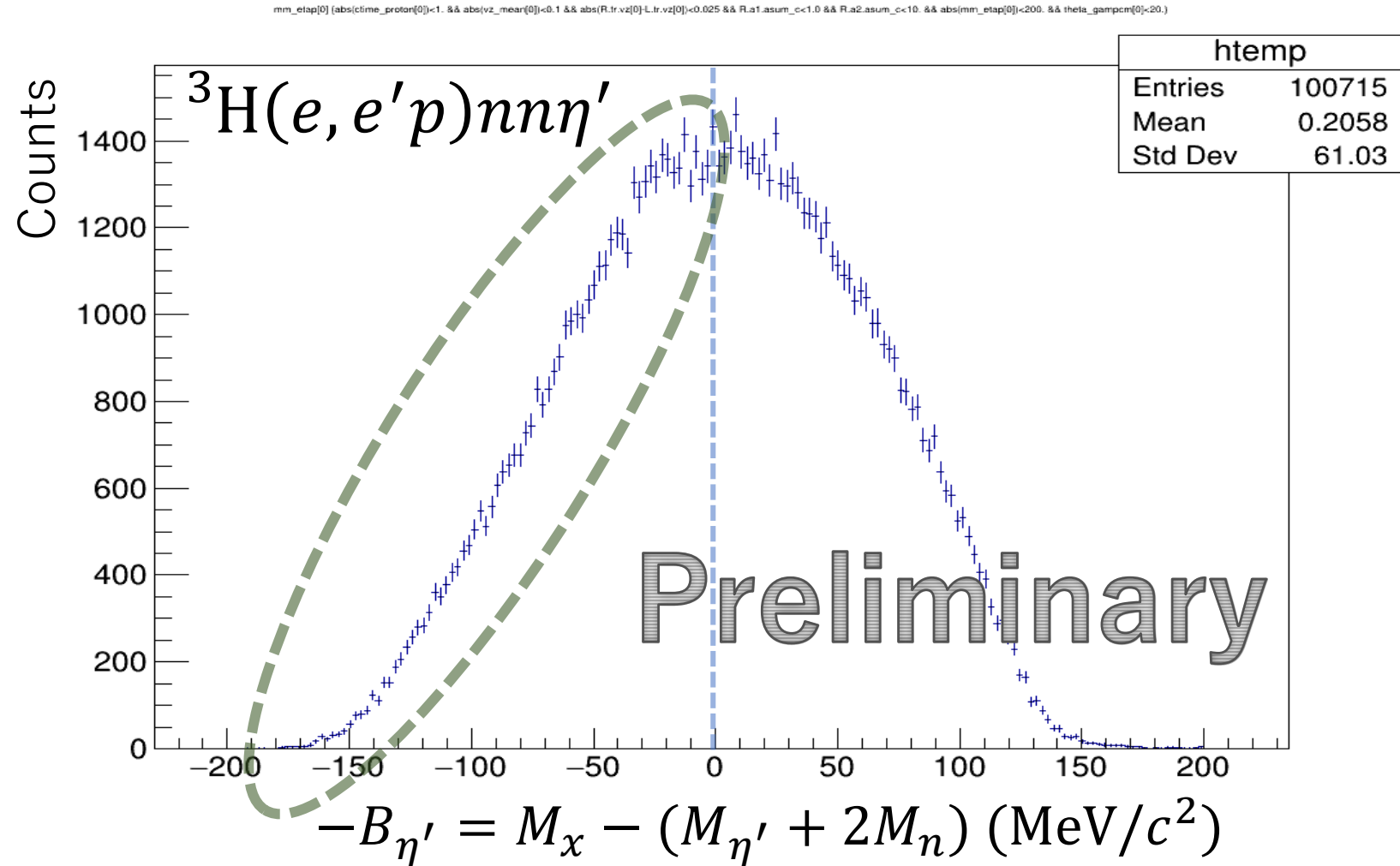
- Elementary production
- Upper Limits for mesic nuclear production

$p(e, e'p)\eta' \rightarrow$ Mesic nuclei ($^{26}\text{Mg} + \eta'$, $nn + \eta'$)

$$\theta_{\gamma p}^{CM} = 5.6 \text{ deg}$$

$$W = 4.38 \text{ GeV}$$

$$Q^2 = 0.49 \text{ GeV}/c^2$$



Accidental Rate Estimation

Geant4 (PCS+HRS+HKS) + Physics Event Generators
(K. Katayama, Master's Thesis, Kyoto Univ. 2020)



SIMULATION



Target	Thickness (mg/cm ²)	Beam Current (μA)	e' (kHz)	ρ (kHz)	π (kHz)	Acc. rate (kHz)	Acc. rate w/ Chernkovs (kHz)
¹² C	100	100	21.5	56	71	0.4	0.023
⁴⁰ Ca	100	50	64.5	48	71	1.2	0.060
²⁰⁸ Pb	100	25	97.0	22	33	0.8	0.041
³ He+ ²⁷ Al	37+160	50	71.8	95	170	2.8	0.13
⁴ He+ ²⁷ Al	74+160	50	74.0	112	197	3.4	0.16

JLab C12-19-002 (${}^3_{\Lambda}{}^4\text{H}$)

<https://www.jlab.org/physics/PAC>

Mar

- Week of 15th: Target meeting (not scheduled yet)
- (About 20th: will ask Dave to write a target part)
- —31st : The first draft will be sent to core members

Apr

- (A week of 19th: JLab Hypernuclear Collaboration Meeting?)
- —30th: A manuscript to be distributed is prepared

May

- 1st —15th: Call for participation in the experiment
- 24th : Deadline for proposal submission

June

July

- 10th: A presentation file is prepared
- 19th—23rd: PAC

New Publications (2021—)

1. Accurate Λ hypernuclear spectroscopy with electromagnetic probe at Jefferson Lab

AIP Conference Proceedings **2319**, 080019 (2021); <https://doi.org/10.1063/5.0037353>

T. Gogami^{1,a)}, T. Akiyama², Y. Fujii⁵, T. Fujiwara², F. Garibaldi^{4,5}, O. Hashimoto^{2,b)}, K. Itabashi², M. Kaneta², K. Katayama¹, N. Lashley⁶, K. Maeda², P. Markowitz⁷, S. Nagao², S. N. Nakamura², Y. R. Nakamura², K. Okuyama², B. Pandey⁶, J. Reinhold⁷, K. N. Suzuki¹, L. Tang^{6,8}, Y. Toyama², T. Toyoda¹, K. Uehara², E. Umezaki¹, G. M. Urciuoli⁴, HKS (JLab E05-115), Jefferson Lab Hall A Tritium, and JLab Hypernuclear Collaborations

View Affiliations

PDF E-READER ABSTRACT TOOLS SHARE METRICS

- Proceeding of APCC14 (Malaysia, 2019)
- Published online (2021): <https://aip.scitation.org/doi/abs/10.1063/5.0037353>

2.

PHYSICAL REVIEW JOURNALS

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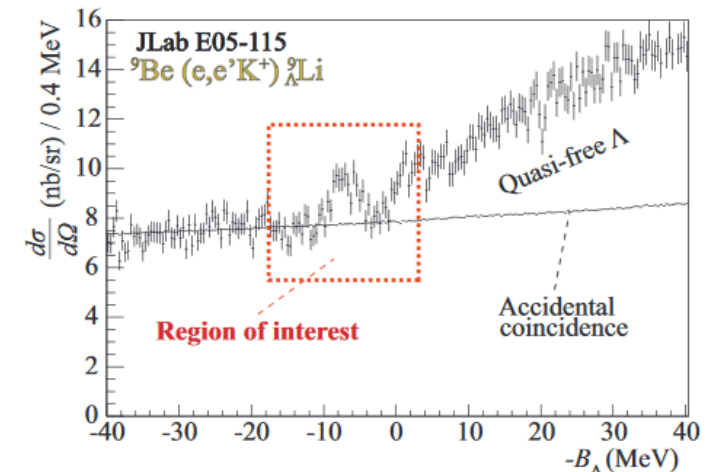
JOURNALS / MY SUBMISSIONS / CBR1057

CBR1057 - Spectroscopy of $A=9$ hyperlithium by the $(e, e'k^+)$ reaction

Correspondence

Opened	Closed	Description
15Feb21		Correspondence (miscellaneous) sent to author
15Feb21		Right to publish signature received
15Feb21		Correspondence (miscellaneous) sent to author
15Feb21		Review request to referee; response not yet received
10Feb21		Acknowledgment sent to author
08Feb21		Correspondence (miscellaneous) sent to author

- Submitted to PRC (Letters) → In review
- <https://arxiv.org/abs/2102.04437>



Workshop, Conference, etc. (Jan—Mar, 2021)

- [Hall A winter Collaboration Meeting](#), Online, Jan 21, 2021
 - T. Gogami (Future hypernuclear experiments with HKS)
- [Asia-Pacific Few-Body Problems in Physics \(APFB2020\)](#), online + onsite (Kanazawa, Japan) hybrid, Mar 1—5, 2021
 - K. Itabashi (Study of the $nn\Lambda$ state and Λn interaction at Jefferson Lab)
 - K. Katayama (Trigger system development for the accurate B_Λ measurement of Lambda hypertriton at JLab)
 - T. Gogami (Lambda hypertriton binding energy measurement at Jefferson Lab)
- [Hadron In Nucleus 2020 \(HIN2020\)](#), online + onsite (YITP, Kyoto University) hybrid, Mar 8—10, 2021
 - J. Reinhold (The Future Hypernuclear Program at Jefferson Lab)
- [JPS 2021 Annual meeting](#), online, Mar 12—15, 2021
 - Many students