

Experiment Overview

JLab Hypernuclear Collaboration

Experimental Readiness Review
June 4–5, 2026

Charge items addressed

Overall readiness picture — Charge 1-(A)

Resource overview — Charge 4-(A)

Publication plan + track record — Charge 5-(C)

JLab Hypernuclear Collaboration

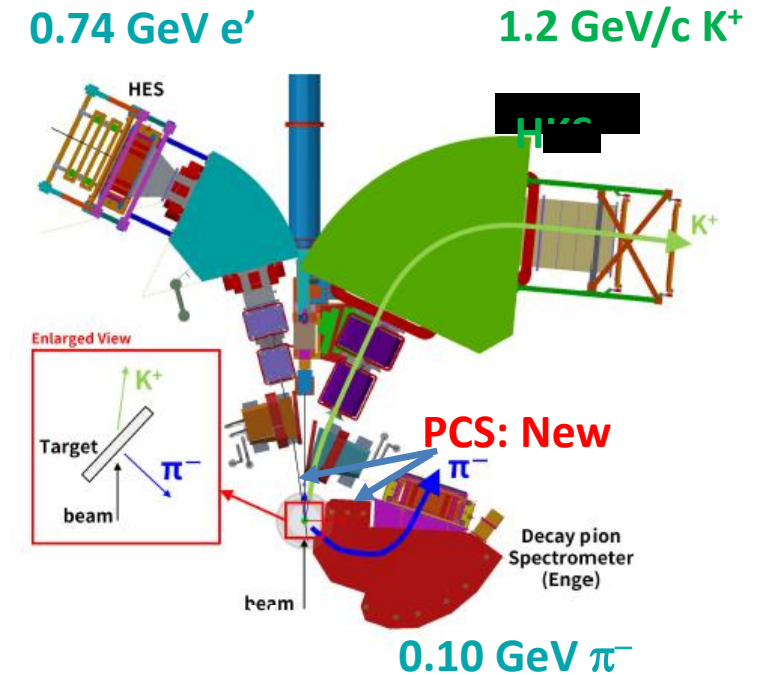
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Scope of the Experimental Program

Approved experiments and common apparatus basis

Program scope

Experiment	Physics topic	Contact person
E12-24-004	CSB in p-shell hypernuclei	T. Gogami
E12-24-011	Triaxial deformation with a Λ probe	S. N. Nakamura
E12-24-013	Isospin dependence of ΛN interaction	S. N. Nakamura
E12-24-003 / E12-18-013	Heavy hypernuclei	F. Garibaldi
E12-20-013A / E12-15-008A	Decay- π spectroscopy	S. Nagao



Common basis

HKS, HES, and ENGE spectrometers

Common beamline and target system

Shared detector infrastructure, DAQ, calibration, and analysis framework

Common installation, commissioning, and operational plan

Physics Motivation and Experimental Strategy

Context

What the program aims to deliver scientifically

Scientific goals

Precision spectroscopy of Λ hypernuclei over a wide mass range

Charge-symmetry breaking in p-shell hypernuclei

Isospin dependence of the ΛN interaction

Λ probe of nuclear deformation

Heavy hypernuclei and Λ behavior in nuclear matter

Complementary decay-pion spectroscopy

Experimental strategy

Use (e,e'K⁺) reaction for high-resolution missing-mass spectroscopy

Use elementary reactions on hydrogen and nuclear calibration targets for absolute energy calibration

Combine HKS/HES magnetic spectroscopy with ENGE-based decay-pion measurements

Maintain a common calibration and analysis framework across experiments

The program fully utilizes the established JLab hypernuclear spectroscopy technique (e.g. HKS, HES), while extending it to a broader and more systematic set of nuclei.

Overall Readiness Picture

Charge 1-(A)

Major progress since the previous ERR

Beamline layout
Updated / under integration
Layout defined.

Spectrometers
Mature with updates
HKS/HES reused; ENGE detectors under development.

Beam requirements
Quantified
Energy and position requirements;
monitoring strategy incl. SLI under development.

Radiation / shielding
Mitigations implemented
SiPM issue resolved by MA-PMT adoption;
shielding layout being finalized.
Recalculation of magnetic field by TOSCA is necessary

Target / vacuum concept
 ^{48}Ca procurement planning, design in progress
Target isolation concept advanced; gate valve added.

PCS magnets / power supplies
Procurement + tests discussed
PCS documentation;
PS procurement.

DAQ / software
Functional baseline
Hall C framework migration largely completed;
online monitoring tested.

Documentation / manpower
Under development
Draft of required documents based on previous ones;
Collaboration charter was drafted.

Design of beam pipe was updated due to sieve slit.
Safe beam transport was checked with all magnetic components with the previous beam pipe design. New TOSCA study for radiation and particle-rate estimates will be completed in the next few months.

Readiness by Subsystem

Charge 1-(A)

Current status and closure items

Subsystem	Current status	Remaining action
HKS / HES spectrometers	Previous operational experience; reused configuration DC repair and commissioning	Test of mass-produced WCs
ENGE spectrometer	Calibration procedure drafted; detector design and development ongoing	Complete TOF/fiber assembly and DC tests
Target system	Updated target list and design; isolation concept	Target handling and safety documentation
Beamline / BPMs	Beam-position requirements studied	Final BPM/girder implementation
Magnets / power supplies	PCS testing discussed; PS procurement underway	Acceptance tests and recommissioning
DAQ / online monitoring	Hall C-based framework functional	Integration test for detector test bench
Analysis software	Reconstruction and decoding functional	Calibration chain and production workflow
Radiation / shielding	SiPM issue resolved by MAPMT readout Detailed simulation platform is ready Updated TOSCA model is necessary	Final shielding layout and documentation Updated TOSCA calculation under study

Message: no single unresolved item currently changes the basic feasibility of the experiment, but several items require disciplined closure before installation and beamtime.

Organization and Resource Overview

Charge 4-(A)

Execution-level governance and technical coordination

Governance

Collaboration Charter was drafted. it defines :

Collaboration Representative / Overall CP

Spokespersons' Committee / Steering Committee

Experiment Contact Persons

Run Coordinator / Analysis Coordinator

Core Member Meeting

CP/ SPs + liaison + sub-WG leaders

Working Groups

HKS, HES, ENGE, detector, DAQ, target, beamline,
simulation, analysis, safety/documentation

Core Member Meeting

Practical coordination forum

Track sub-WG progress and action items

Coordinate with JLab engineers and Hall C staff

Identify technical bottlenecks early

Escalate major decisions to the Steering Committee

Collaboration is moving to execution-level governance.

Schedule

Charge 4-(A)

WBS	Task	Start Date	End Date	Duration (days)	Responsible group	Status	Required FTE	FTE-months	Committed FTE	Manpower notes	Schedule notes	2026 Q2	2026 Q3	2026 Q4	2027 Q1	2027 Q2	2027 Q3	2027 Q4	2028 Q1	2028 Q2	2028 Q3	2028 Q4	2029 Q1
0	Pre-installation readiness and preparation	2026-05-01	2027-08-31	488	CP/SP/Core members	In progress					Packed preparation items before Hall C installation.	■	■	■	■	■	■	■					
0.1	Updated TOSCA field maps and radiation estimation	2026-06-01	2026-08-31	92	Beamline/Magnet WG	In progress	1.5	4.5		3 staff + 1 student	Follow-up confirmation study for refined geometry.	■	■										
0.2	PCS magnet tests / acceptance tests	2026-06-01	2026-12-31	214	Magnet WG / JLab	In progress	1.1	7.7		1 staff + 3 students	Visual inspection, insulation, excitation, BJ curve, Test Lab acceptance.	■	■	■	■	■	■	■	■	■	■	■	■
0.3	Magnet power supplies: procurement and re-commissioning	2026-06-01	2027-12-31	579	Engineering / Magnet WG	In progress	0.3	5.7		1 staff	New PS procurement; existing HKS/HES PS test	■	■	■	■	■	■	■	■	■	■	■	■
0.4	Target design, fabrication, and handling procedures	2026-06-01	2028-01-15	594	Target WG / JLab	In progress	1.7	33.2		2 staff + 1 student	Target isolation, Li/Ca protection, water backup, handling documentation.	■	■	■	■	■	■	■	■	■	■	■	■
0.5	ENGE detector completion and test	2026-06-01	2027-08-31	457	ENGE WG	In progress	1.5	22.5		1 staff + 3 students	TOF modification, fiber detector assembly, MAPMT delivery.	■	■	■	■	■	■	■	■	■	■	■	■
0.6	Analysis software framework readiness	2026-05-01	2026-12-31	245	Analysis WG / Hall C	In progress	0.6	4.8		1 staff + 1 student	Hall C framework; decoding/reconstruction; Panguin; production workflow by end of 2026.	■	■	■	■	■	■	■	■	■	■	■	■
0.7	Simulation and optics	2026-06-01	2026-12-31	214	Magnet WG / JLab	In progress	1.1	7.7		1 staff + 3 students	GEANT4 model based on TOSCA magnetic field	■	■	■	■	■	■	■	■	■	■	■	■
0.8	Calibration workflow and commissioning-data analysis preparation	2026-09-01	2028-06-01	640	Analysis/Optics WG	Planned	2.0	42.0		1 staff + 3 students	Preparation for detector calibration, optics workflow, and ENGE alpha-source calibration.			■	■	■	■	■	■	■	■	■	■
0.9	Beam diagnose, SLI development	2026-05-01	2027-03-31	335	CP/SP/Core members	In progress	1.5	16.5		1 staff + 1 student	Beam diagnose tool and SLI development	■	■	■	■	■	■	■	■	■	■	■	■
0.10	Governance, manpower, documentation, and risk register	2026-05-01	2028-01-15	625	CP/SP/Core members	In progress	0.5	10.3		2 staff	Charter, manpower matrix, shift estimate, document status table, risk register.	■	■	■	■	■	■	■	■	■	■	■	■
1	Hall C Hypernuclear installation plan	2027-09-01	2029-01-31	519	Hall C / HKS Collaboration	Planned	Estimation will be given by engineer gr.				Packed installation schedule; detailed engineer/technician plan is presented separately.									■	■	■	■
1.1	SHMS beam-right move and Anaconda fixture	2027-09-01	2027-12-17	108	Engineering/Technicians	Planned					Relocation of SHMS									■	■	■	■
1.2	ENGE installation	2027-12-17	2028-02-23	69	Engineering/Technicians / ENGE WG	Planned					ENGE transfer, support frame, detector package, shielding.									■	■	■	■
1.3	Target support/platform and upstream girder	2028-01-13	2028-02-24	43	Engineering/Target WG	Planned					Target support post, target platform, upstream girder support stand.									■	■	■	■
1.4	PCS magnets and beamline installation	2028-02-08	2028-04-24	77	Engineering/Magnet WG	Planned					Packed: target chamber, sieve sits, PCS stand/magnets, first beamline section, LCW electrical survey.									■	■	■	■
1.5	HES arm installation	2028-04-21	2028-07-13	84	Engineering / HES WG	Planned					HES support, magnets, detector, shielding, survey.									■	■	■	■
1.6	HKS arm installation	2028-07-13	2028-10-24	104	Engineering / HKS WG	Planned					HKS support, magnets, detector, shielding, vacuum pumps, cable trays, DC power cables.									■	■	■	■
1.7	LCW lines and power connections	2028-10-24	2028-12-18	56	Facilities / Engineering	Planned					LCW lines, DC supplies, 480 Vac lines, power-on power supplies.									■	■	■	■
1.8	Tune and calibration	2029-01-03	2029-01-31	29	Hall C / Collaboration	Planned					Final tune and calibration period in the installation schedule.												■

Publication Plan and Previous Track Record

Charge 5-(C)

Results pipeline and collaboration review process

Track record

Successful high-resolution Λ hypernuclear spectroscopy at JLab
Established (e,e'K+) technique using HKS/HES
Demonstrated missing-mass spectroscopy with sub-MeV resolution (world's best reaction spectroscopy of Λ hypernuclei)
Published physics and technical outputs from previous campaigns (PRL, PRC, PTEP, NIM and many proceedings)
Calibration, optics, and analysis experience directly relevant to the present program

Publication governance

Results reviewed within the Collaboration before public release. Experiment Contact Persons coordinate experiment-specific publications and presentations. University seminars, informal institutional presentations, and domestic academic society meetings may be treated separately, with appropriate care for unpublished results.

Publication plan

Stage	Publication / output
Before running	Technical notes, calibration procedures, readiness documentation: Radiation damage to SiPM, new fiber detector
Commissioning	Detector, optics, and calibration performance reports : a calibration tech., SLI development
Early physics	Calibration reactions and light hypernuclear spectra: ${}_{\Lambda}^{12}\text{B}$, ${}_{\Lambda}^6\text{He}$, ${}_{\Lambda}^9\text{Li}$, ${}_{\Lambda}^{11}\text{Be}$
Full analysis output	Mid. Heavy ${}_{\Lambda}^{40,48}\text{K}$ isospin dep. ΛNN , ${}_{\Lambda}^{208}\text{Tl}$ heaviest hypernucl. , ${}_{\Lambda}^{27}\text{Mg}$ triaxially deformed
Program-level outcome	1) Systematic results across p-shell, medium-mass, and heavy hypernuclei to solve hyperon puzzle 2) A new calibration source for future study of hypernuclear spectroscopy 3) Clarify CSB of Λ hypernuclei by a novel technique

Summary and Path to Beamtime

Close

Items to close before installation and commissioning

Overall readiness picture

The experimental concept is mature and based on a proven technique of previous JLab hypernuclear experiments.

The current program extends previous success to a broader set of nuclei and complementary spectroscopy methods.

Major technical issues identified in the first ERR have been addressed or are under active resolution.

Remaining work is concentrated in engineering closure, documentation, resource-loaded scheduling, and reasonable manpower assignment.

Immediate priorities

Finalize the updated TOSCA model with the revised beam-pipe design and confirm radiation levels and detector singles rates.

Secure long-lead-time targets, especially ^{48}Ca , and advance target-chamber design and fabrication.

Prepare the required safety and operational documentation.

Strengthen collaboration governance and secure manpower for installation, shifts, calibration, and analysis.

The collaboration is technically prepared to move toward installation and commissioning, provided that the remaining simulation validation, target preparation, documentation, and manpower items are closed on the defined schedule.

