

Hall D Status

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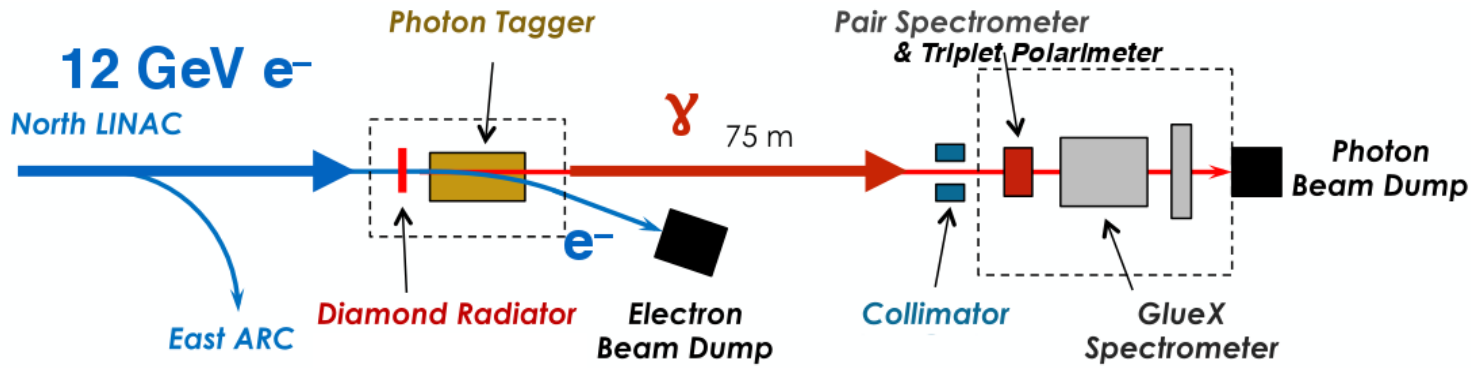
Overview

- Brief JLAB Status
- Hall D facility
- Approved physics program
- Physics Division Readiness Review
- Budgeting and staff
- Schedule

JLAB Status

- JLAB is in MEDCON2 (new definitions of the levels)
 - Masks are not required, except for working at <3 ft from other people
 - Daily self-certification is still required
 - Users are allowed on site
 - Vaccination status does not need to be reported in order to work on site
- Hybrid and remote work policy for staff, formalizing the “remote work” conditions and requirements. Four categories, with a number of requirements. Formal agreements with the supervisors required.
 - Dedicated 100% on-site
 - Flexible: > 60% on-site
 - Remote: < 60% on-site, within commuting distance, no permanent office
 - Virtual: anywhere
- Lab is involved in EIC construction
 - NP long range plan may include EIC project recommendation and EIC Detector-2 Initiative
 - \$33M to EIC from Inflation Reduction Act (IRA)
- Lab management as well as users are interested in energy upgrade
 - NP long range plan may include CEBAF Energy Upgrade Initiative
- Budget:
 - For current lab budget Continuing Resolution till mid December
 - MOLLER experiment is funded by IRA (\$31.2M)
 - CEBAF Renovation and Expansion project is funded by IRA (\$10M)
 - Laydown Yard Expansion will receive \$2.2M from IRA.

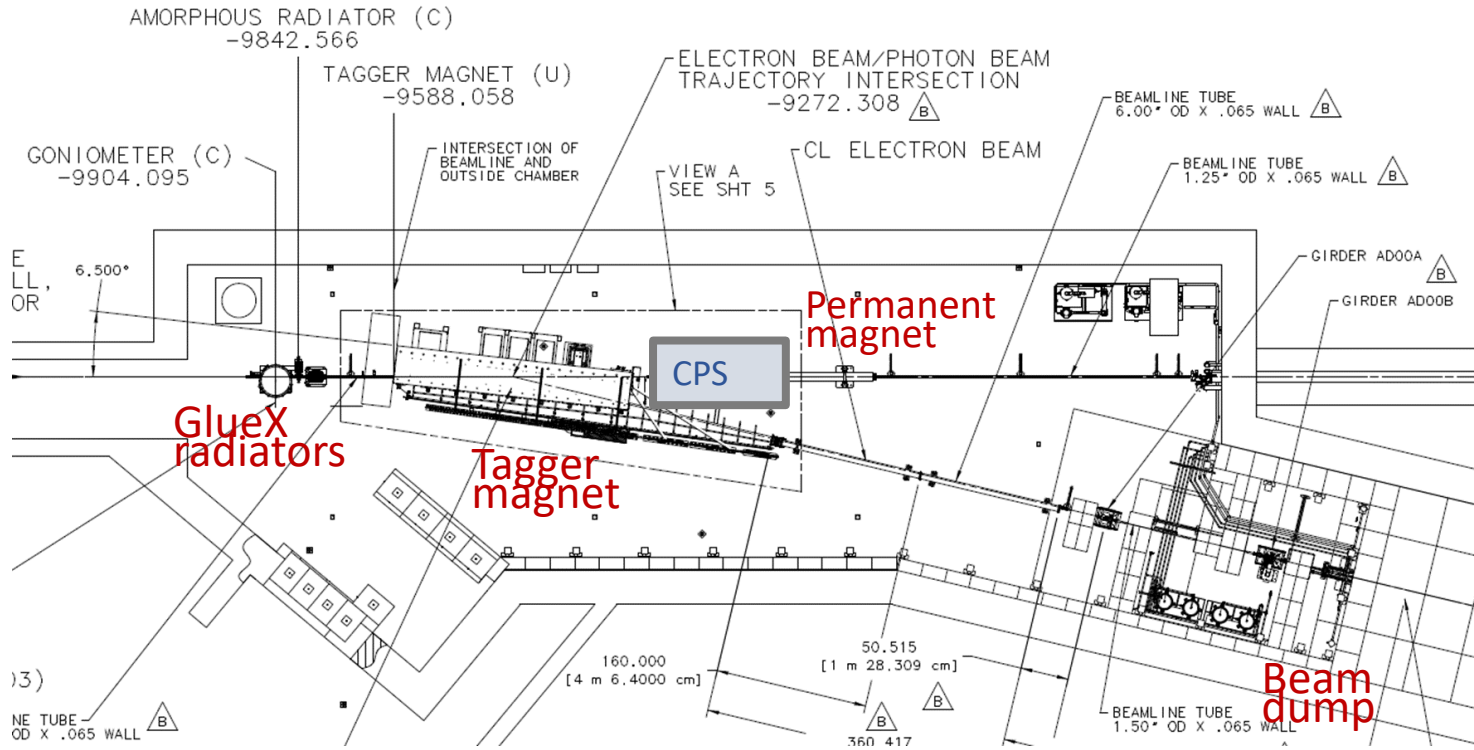
Hall D Apparatus



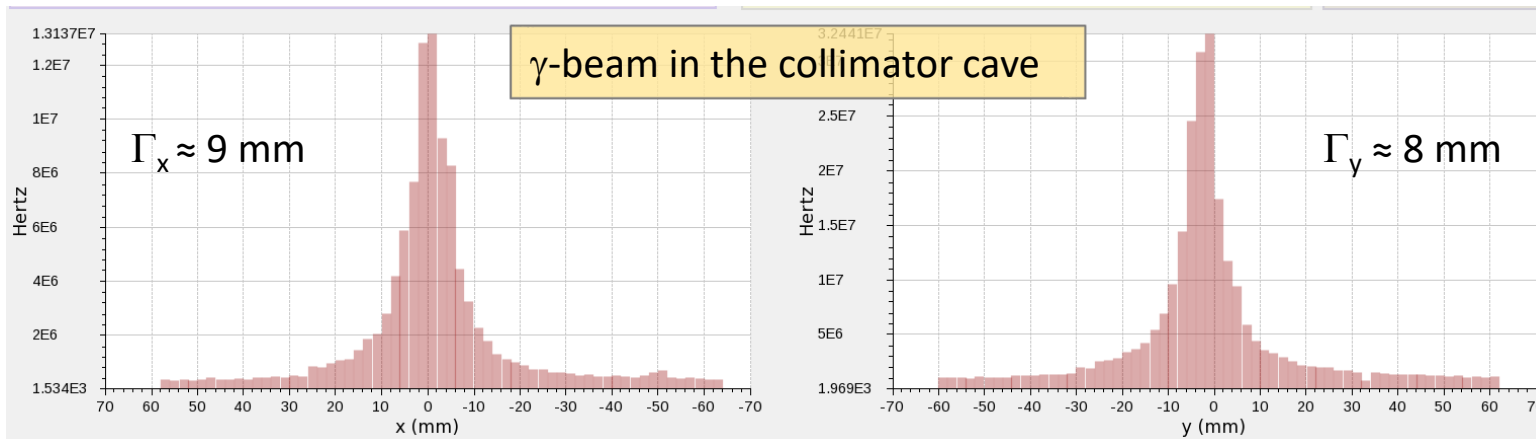
- Hall D complex consists of two halls:
 - Tagger Hall for photon beam creation
 - Hall D for particle and event detection
- Acceptance: $1^\circ < \theta < 120^\circ$
- Resolutions for h^\pm : $\sigma_p/p \approx 1 - 3\%$
- Resolutions for γ : $\sigma_E/E \approx 6\%/\sqrt{E} + 2\%$
- Trigger: photoproduction at $E_{\text{BEAM}} > 7 \text{ GeV}$
- In 2020: 85 kHz (signal + EM background)



Hall D Beam



- Linearly polarized photon beam for GlueX produced 75m upstream of the main hall.
 - The beam could have circular polarization as well.
 - Beam bunches normally are spaced 4ns apart
 - There is a couple of nA bleedthrough from the other halls.
 - 1mm x 0.5mm beam size in σ_x and σ_y at the GlueX radiator
 - Beam also could be rastered upstream of the tagger hall using FFB magnets.
 - Rastering using 5C11B correctors is being developed for GlueX.
 - Can run 5 μ A e-beam on the tagger dump.
 - Photon beam monitor at the entrance to Hall D
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- Hall-C style CPS could be placed in the tagger hall where there is sufficient room for it.
 - A larger design could probably be accommodated as well.
 - Will need to optimize the length and the gap size for CPS.

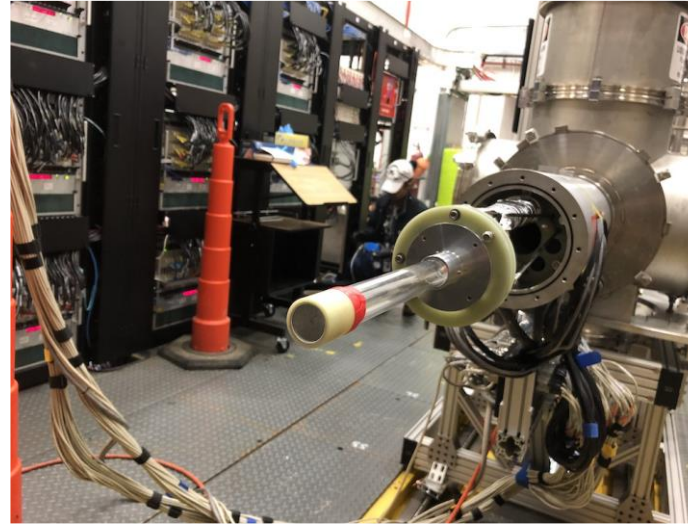


Hall D Targets

LH2, LD2, LHe $\varnothing 15 \times 300 \text{ mm}$



Be $\varnothing 25.4 \times 17.75 \text{ mm}$

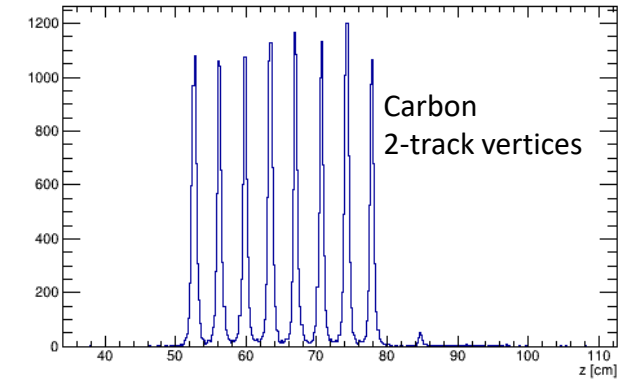


^{12}C $8 \times \varnothing 20 \times 2.3 \text{ mm}$



Target	Experiment	Thickness		Neutron Radiation, relative
		RL	g/cm^2	
LH2	GlueX, PrimeX- η	3.5%	2.1	1
LD2	SRC	4.1%	5.1	2.4
LHe	PrimeX- η , SRC	3.7%	3.5	1.7
Be	PrimeX- η	5.0%	3.3	1.6
Carbon	SRC	7.9%	3.4	1.6
Lead	CPP/NPP	5.0%	3.2	1.5

z for $r < 0.5 \text{ cm}$



^{208}Pb $\varnothing 25.4 \times 0.3 \text{ mm}$



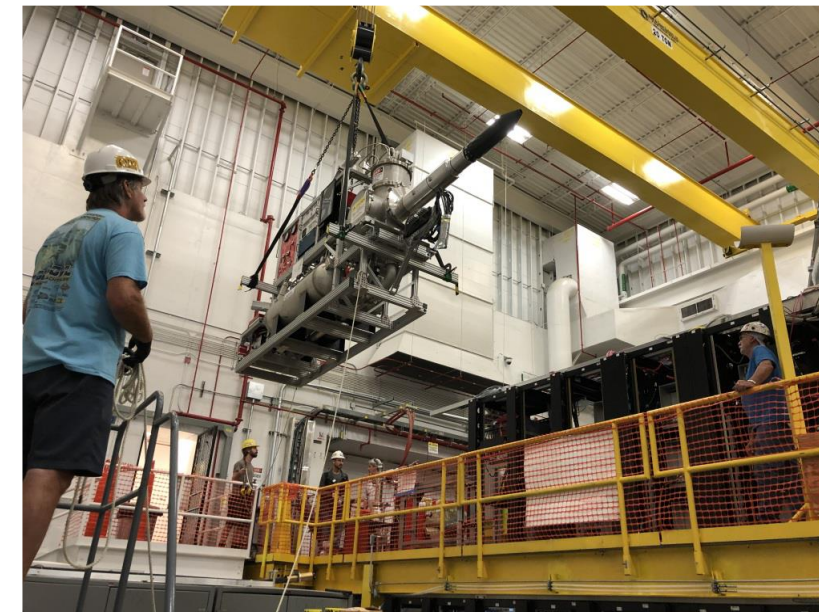
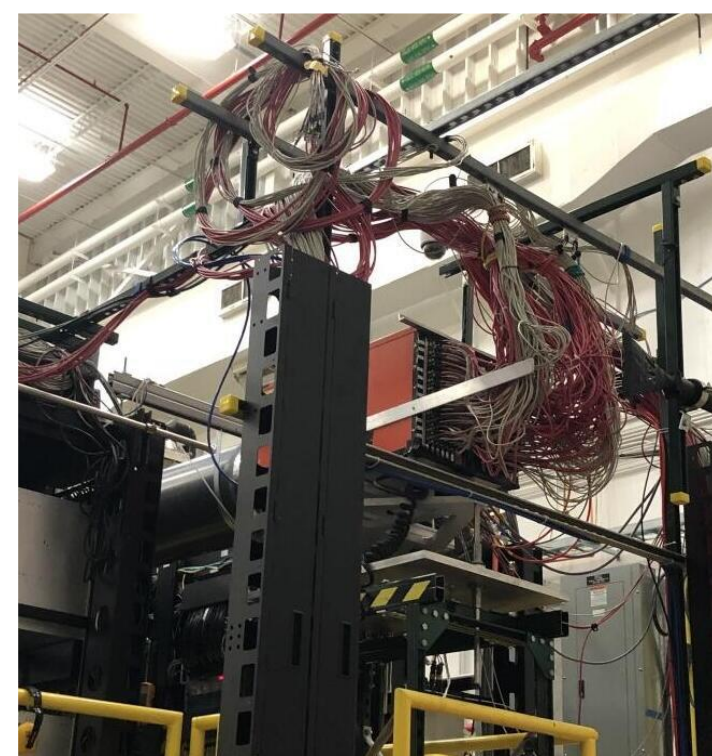
- Polarized target in the distant future (REGGE)

Physics program

Experiment	Title	PAC Rating	PAC days	PAC #	Data taken
E12-06-102	Mapping the Spectrum of Light Quark Mesons and Gluonic Excitations with Linearly Polarized Photons	A	120	30	100%
E12-12-002	A study of meson and baryon decays to strange final states with GlueX in Hall D	A	220	42	33%
E12-13-003	An initial study of hadron decays to strange final states with GlueX in Hall D	Grp	200	40	0%
E12-13-003 A	A Eta Decays with Emphasis on Rare Neutral Modes: The JLab Eta Factory (JEF) Experiment	Grp	100	45	0%
E12-10-011	A Precision Measurement of the eta Radiative Decay Width via the Primakoff Effect	A-	79	35	>80%
E12-13-008	Measuring the Charged Pion Polarizability in the $\gamma\gamma \rightarrow \pi^+ \pi^-$ Reaction	A-	25	40	100%
A	Measuring the neutral pion polarizability	Grp		48	100%
E12-19-003	Studying Short-Range Correlations with Real Photon Beams at GlueX	B+	15	47	100%
E12-19-001	Strange Hadron Spectroscopy with Secondary KL Beam in Hall D	A-	200	48	0%
E12-20-011	Measurement of the high-energy contribution to the Gerasimov-Drell-Hearn sum rule	A-	33	48	0%

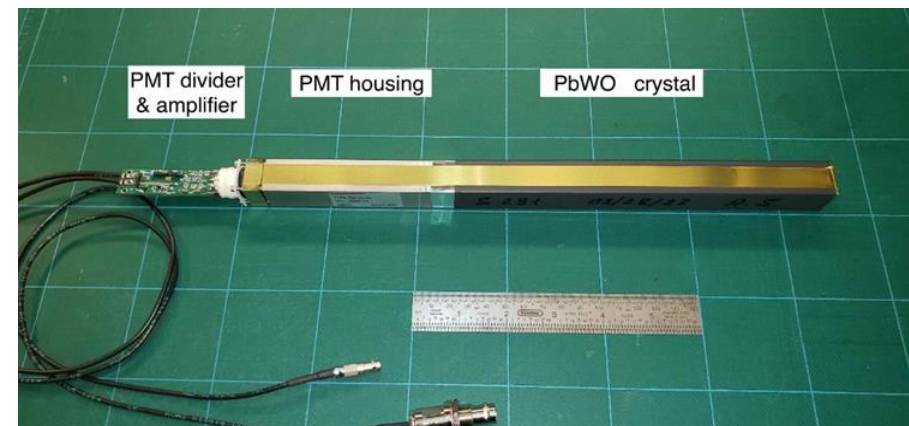
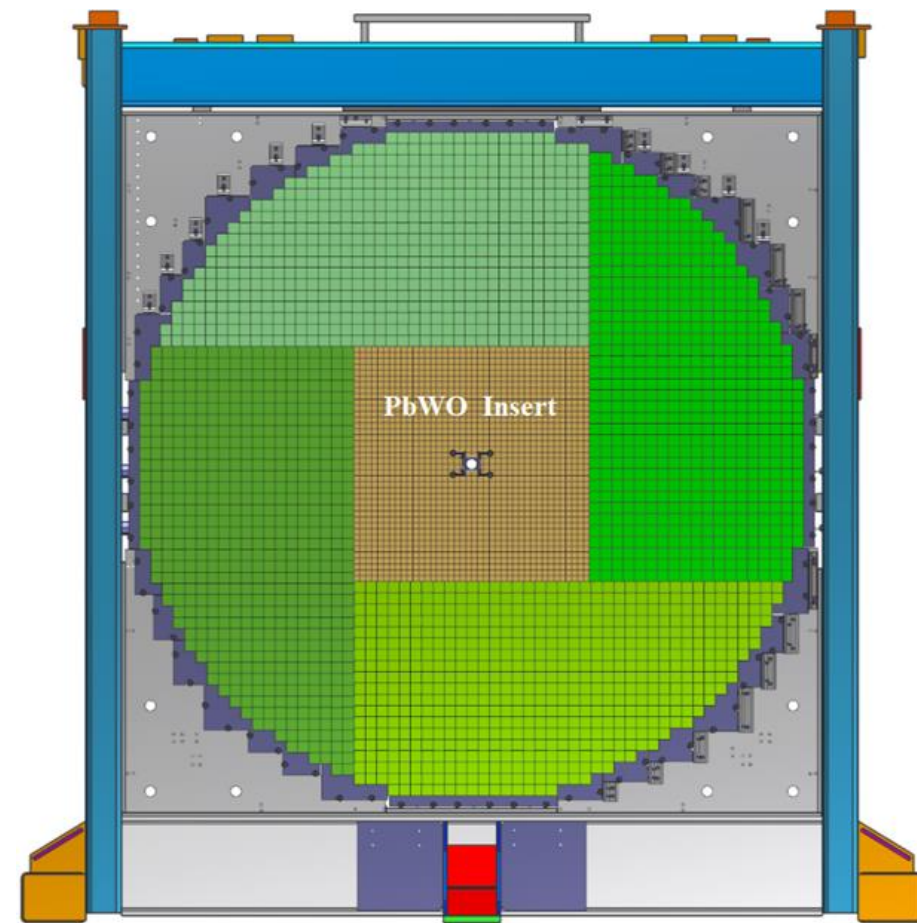
Upcoming Hall D running

- Finish PrimEx- η run (113 calendar days), currently running in Hall D
- Changeover to GlueX-II before and after holidays
 - TAGM full restoration
 - DIRC installation
 - COMCAL removal?
 - Target cell change?
- GlueX-II run lasting just 63 calendar days
- FCAL upgrade
- GlueX-II run conclusion with FCAL-2
- KLF installations and running
- Deinstall KLF, install and run REGGE



FCAL-2 Upgrade

- Install an array of 40 x 40 PbWO₄ modules in the inner part of the FCAL (replace lead glass modules)
 - ✓ 2 cm x 2 cm x 20 cm PbWO₄
 - ✓ 4 cm x 4 cm x 45 cm lead glass
- A factor of 4 better detector granularity
 - ✓ significantly improve shower separation
 - ✓ improves the energy and position resolutions by about a factor of 2
- Use COMCAL as a prototype for the design.
- Most of the procurements are complete.
- A lot of work to be done during next 18 months
 - ✓ FCAL will need to be disassembled and reassembled with a new frame end dark room.
 - ✓ Start installation in May of 2023 and end in May of 2024



KLF and Hall D

- Capital construction budget for KLF - \$2M (expected but not certain)
 - JLab: capital funding - \$0.4-0.7M/FY, started in FY23: 2023-2026
 - The FY23 budget should provide KLF capital funding of \$400K, budgets not confirmed yet
 - External funding should be helpful.
 - Large spending contingent on Phase 1 ERR review
 - We are not allowed to spend significant amount before this review.
- Operations budget for KLF for items that may also be used for other experiments.
- Current JLAB efforts
 - KPT: one designer is working on the model of the Be target assembly and on the technical design the beamline in Hall D.
 - CPS: conceptual design needed before engineering design and procurements
 - Tim and Hovanes are helping with CPS conceptual design
 - Other elements: Lab will address the tasks depending on resources
- 2025: earliest finishing of the approved photon beam experiments
 - Includes a break for the FCAL2 installation
 - Often schedules gets delayed, it is not a guaranteed date

Hall D budget and staffing

- FY23 capital budget
 - KLF Designer's work
 - Laser procurement for KLF
 - KLF equipment for the collimator cave
- Hall D Staff:
 - Scientific group:
 - 13 staff scientists and 1 postdocs
 - Mark Ito and Elton Smith retired
 - New staff scientists hired: Boris Grube, Malte Albrecht and Igal Jaeglé
 - One postdoc position opened and advertised in October
 - Supported: 3 university postdocs and one tech (all at a 50% level)
 - Technical group:
 - 1 mechanical engineer, 1 designer, and 6 techs
 - Mark Stevens is retiring next month

NPD Reviews

- Physics division requires multiple reviews in certain cases.

- At the design phase

- Identify risks and mitigation measures.

- Construction phase

- Verify that the construction is on track and that the equipment will be ready for beam

- Before starting the experiment

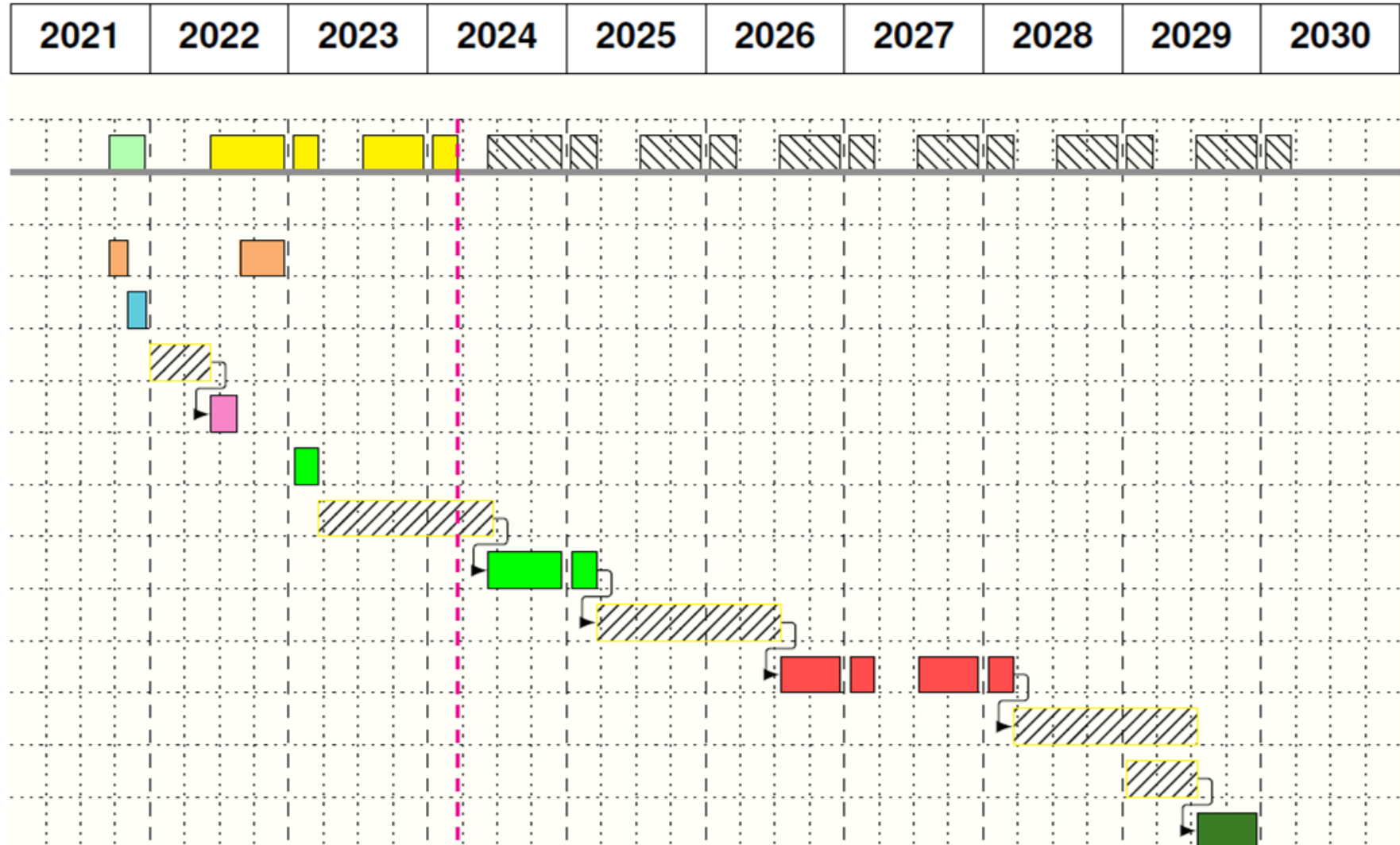
- All JLAB experiments undergo this review before Experiment Readiness Clearance is issued.
- All procedures need to be well defined and documentation need to be complete.

Preliminary Planning Phase		<ul style="list-style-type: none"> Exp. Description and Requirements Exp. Readiness Review Calendar 			
		When is ERR?	Need	Requirements/Outcome	What to do
		N. 1: Before construction phase starts or existing equipment with high risk	<ul style="list-style-type: none"> If the experiment includes one-of-a-kind equipment with potential novel safety implications (examples: SC magnets, tritium or high-power cryogenic targets). 	<ul style="list-style-type: none"> Fabrication of the equipment can start or it is deemed to be acceptable for use at the lab. 	<ul style="list-style-type: none"> Provide the complete conceptual design of the full equipment. Decommissioning plans for target and activated components must also be developed as appropriate. Carry out a safety analysis of the proposed equipment design, identify safety issues and incorporate mitigating measures necessary to be operated in planned experiment. Provide manpower and resource requirements for equipment fabrication
Design Phase					
From NPD web site: https://www.jlab.org/physics/experiment_process/np-pfx-chart					

Phase 1 ERR by Nuclear Physics Division

- Review is requested by NPD in January or February 2023
 - This is the Review in the designing/planning phase
 - Does not put KLF on the firm experiment schedule
 - Permission to spend significant amount of NPD money on KLF
 - Patrizia Rossi from NPD is organizing the review
- Conceptual designs of JLAB-built KLF components will be reviewed
 - Beamline, CPS and KPT are to be build by JLAB
 - Risk factor and mitigation measures
 - Kaon Flux Monitor will be provided by UK
 - May not be a part of the review
 - Cost estimates
- Estimates of heat deposition, cooling and radiation environment will need to be presented.
 - Not clear if the radiation levels at the lab boundary and to what precision need to be evaluate by RadCon group for the review.
 - Not clear if the accelerator progress will be reviewed as well.
 - This meeting should help defining the charge for the review.
 - The design does not have to final, design modification are possible before Phase #2 ERR.
- It is highly desirable to have a document on the CPS conceptual design for the reviewers.
- The charge to the committee has not yet been finalized.

Hall D plans



Approved schedule

- Assumed 35 weeks/year for Hall D running 2024/06-2025/03 and 30 weeks afterwards

- Assumed timely budgeting for KLF and REGGE

- Assumed timely construction of JEF,KLF,REGGE

Summary

- Hall D experimental facility so far has been performing well.
- Most of the physics data for meson production/GlueX program has been collected
 - GlueX Collaboration is working on the publications
 - GlueX analysis effort underwent a successful review by JLab.
- Upgrade of the FCAL starts next year
 - FCAL2 procurements from capital budget are complete.
 - FCAL2 modules construction is almost complete.
- The NPD Phase 1 ERR of KLF is being organized, expected in January 2023
- KLF should be able to receive capital funding after successful review
 - Need a CPS conceptual design, preferably with a document, with cost estimates.
- Earliest start of KLF installation is in the middle of FY25.