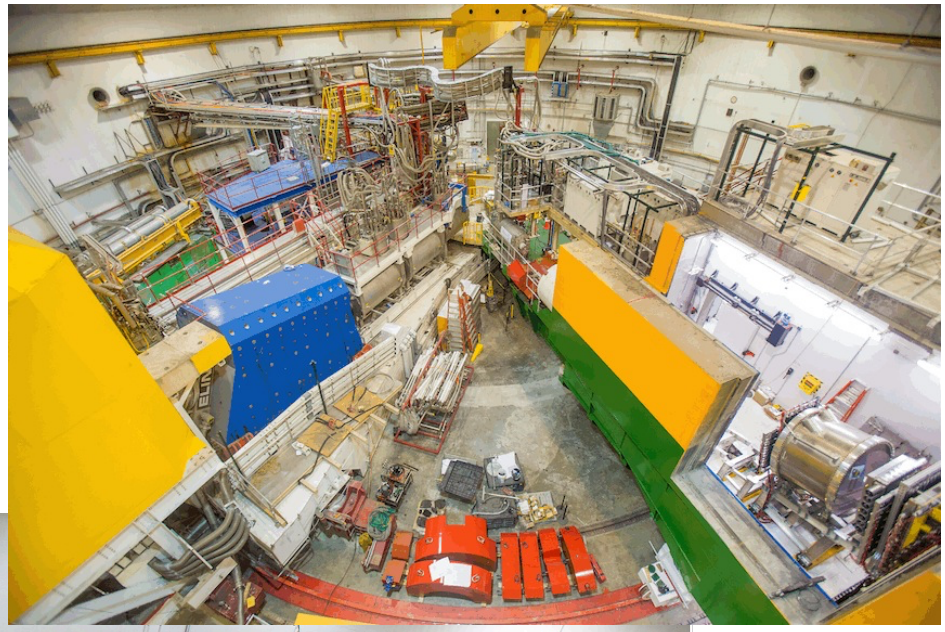
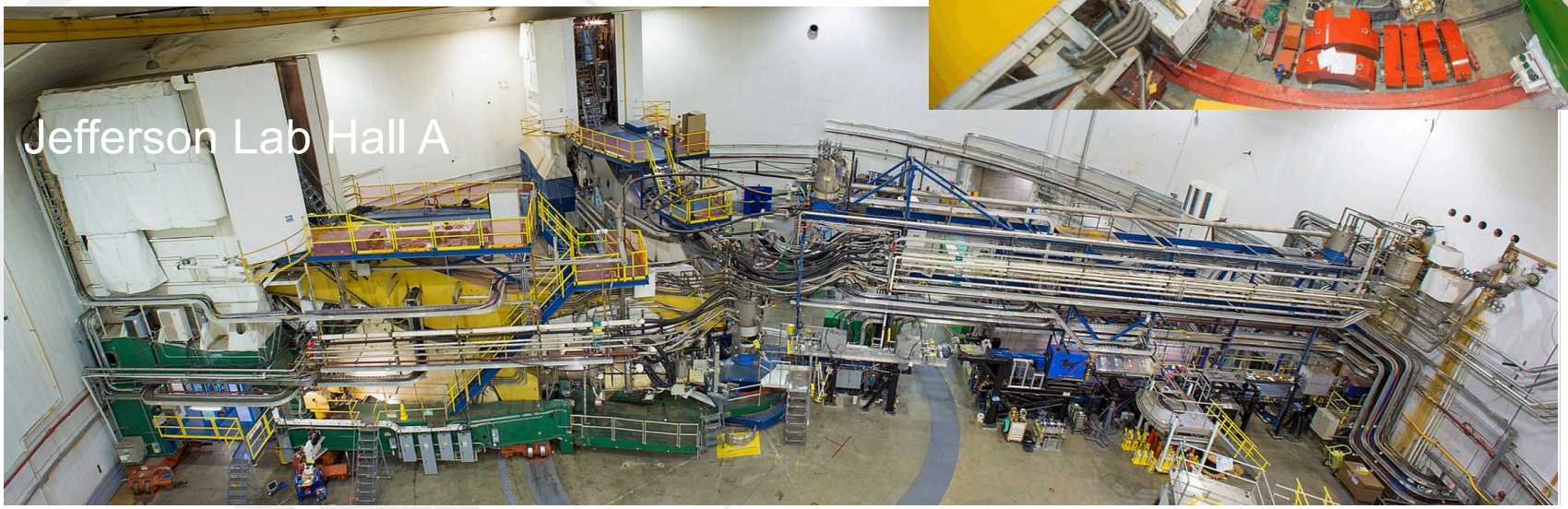
Hall A and C Plans

Thia Keppel

Hall A/C Summer
Collaboration Meeting
June 2019





Hall A Experiment Schedule

(see https://www.jlab.org/exp_prog/experiment_schedule/2019/20190606.0.pdf)

	Spring + Fall	Spring + Fall	Spring	Summer	Fall	Spring 2020	Spring 2021
CY 2017	Ar(e,e'p) + ^{3}H/^{3}He group*						
CY 2018		^{3}H/^{3}He group		YOU ARE HERE			
CY 2019/20			*APEX***	*PREX2*	*CREX*	*CREX*	
CY 2021							SBS GMn + GEn-RP**

Long cryo down, CHL replacement

DVCS, G_M^p preceding

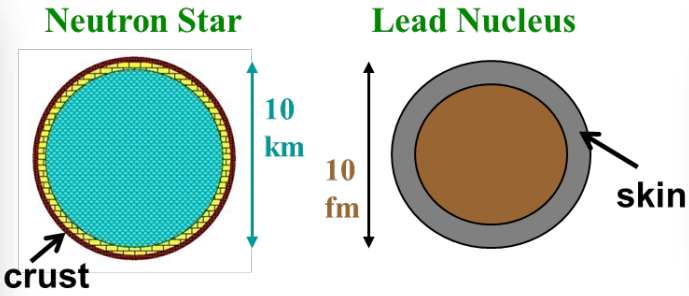
MOLLER, SoLID to follow

* *Very brief physics run (~couple days only)*

Experiments in red represent PAC "high impact" experiments

** = *best effort*

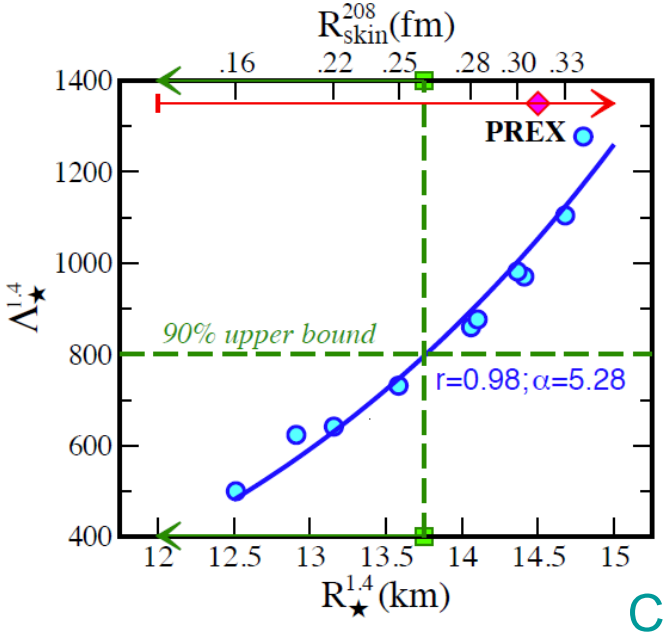
2019 Hall A Summer Run: PREX2/CREX



(LIGO) (JLab)

See Rakitha Beminiwattha talk today!

Measurement of neutron skin at JLab constrains tidal polarizability of neutron stars

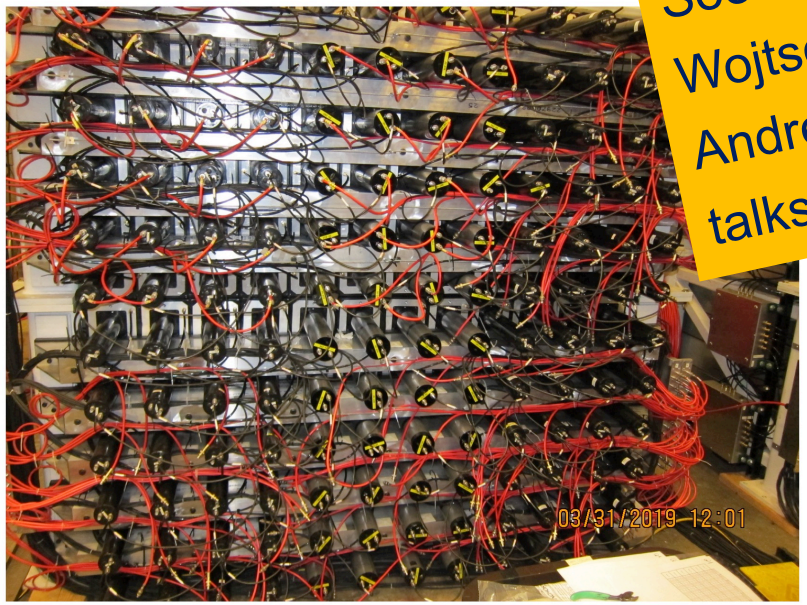


Phys. Rev. Lett. 120, 172702 (2018)

Check out installation video at https://hallaweb.jlab.org/tech/pictures/RightSideCamera.AVI

SBS Status

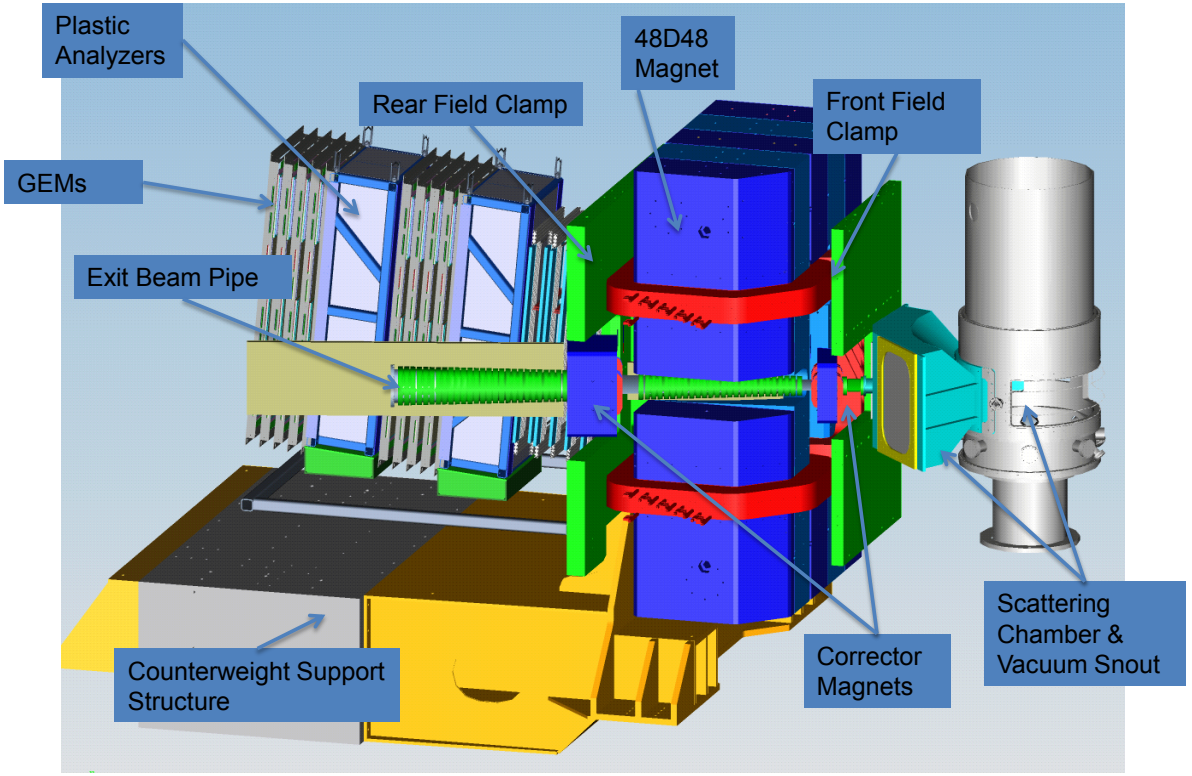
- Construction of the structural and magnetic elements, HCAL, GEMs, CDet, ++ have been completed (supported by DOE/INFN/ NSF/NSC ++).
- Commissioning of all equipment items (also BigBite, GRINCH,..) - and software - is underway
- Collaboration efforts are focused on G_M^n and G_e^n-RP preparation for 2020 – *tour the test lab!*



See Bogdan Wojtsekhwski, Andrew Puckett talks!

Looking Towards 2020: All Major SBS Components Now at JLab

– time to integrate, test,
ready for GMn!



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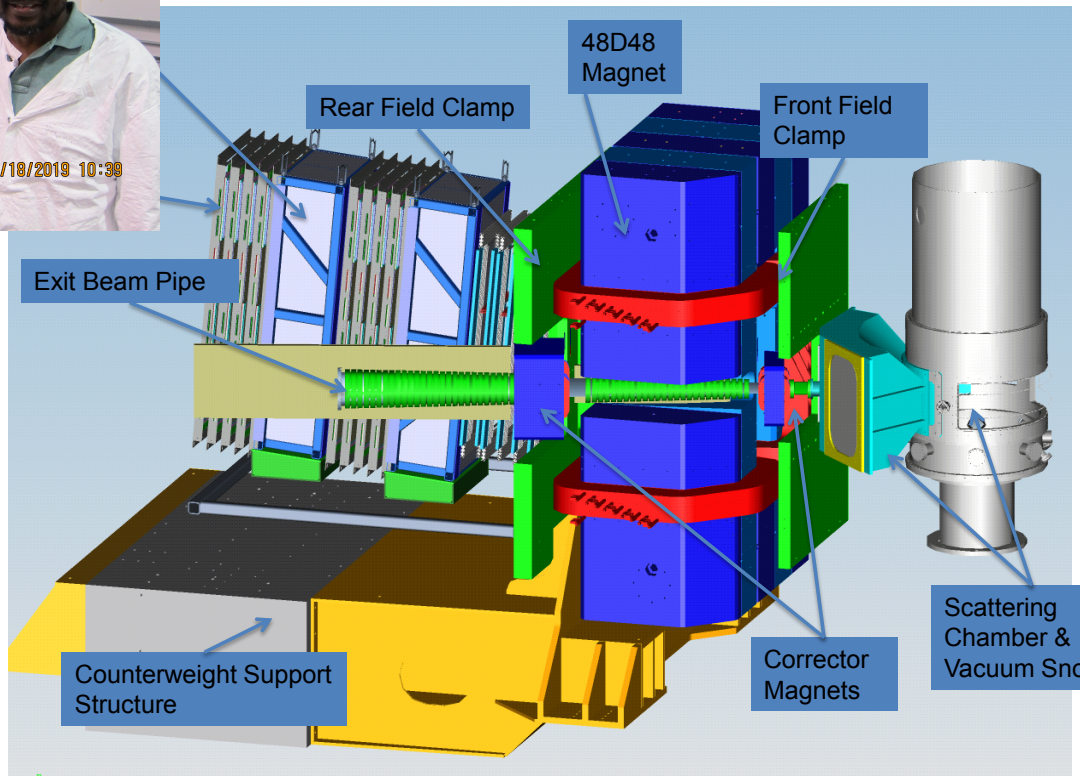

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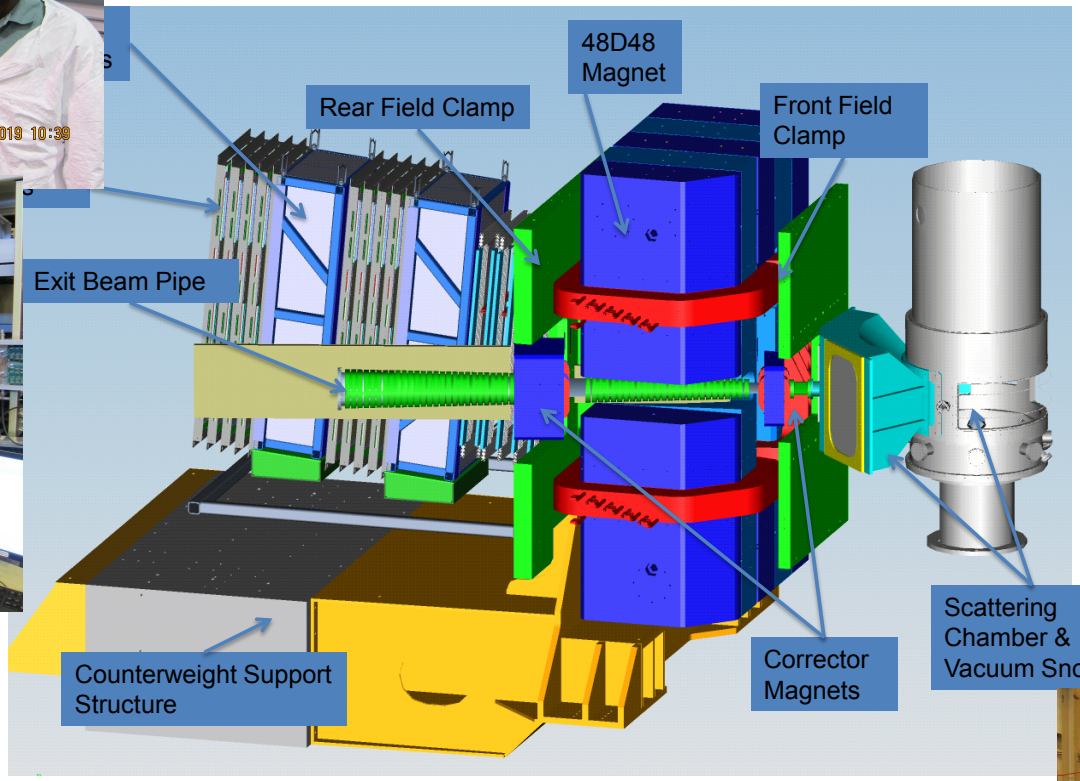

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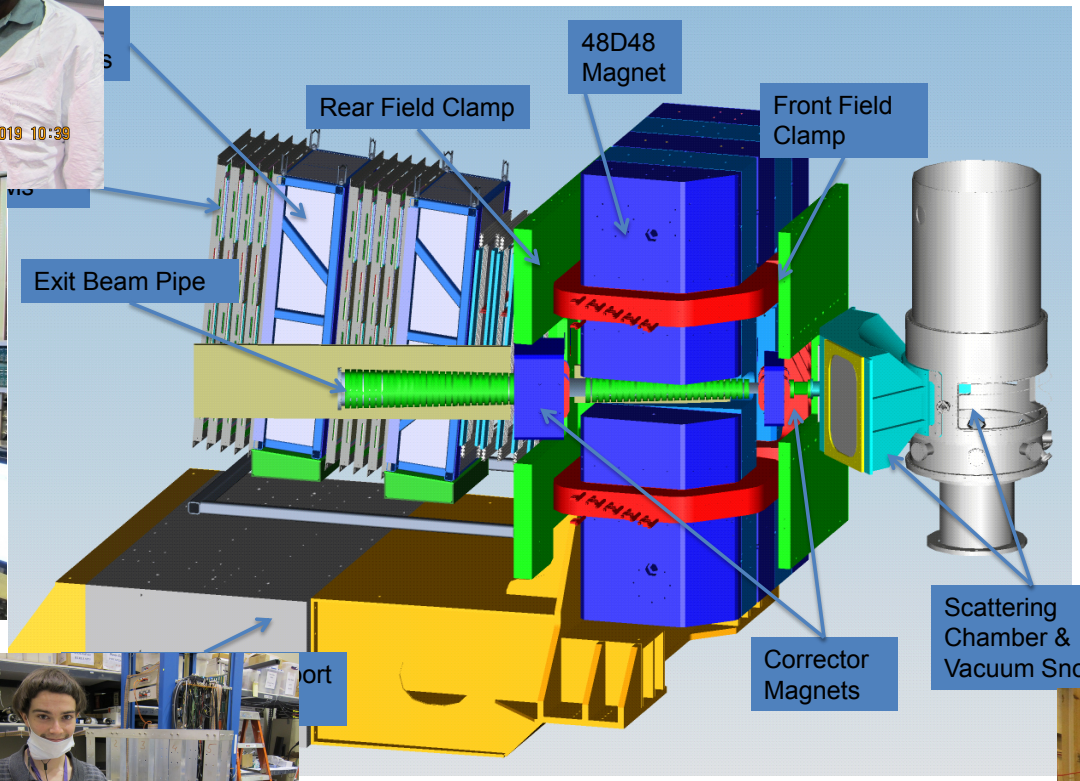

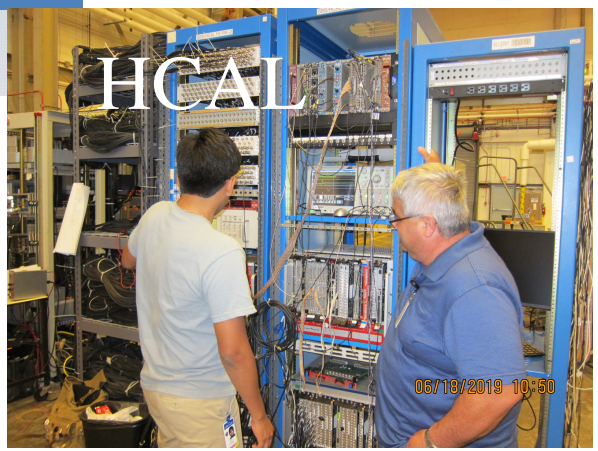

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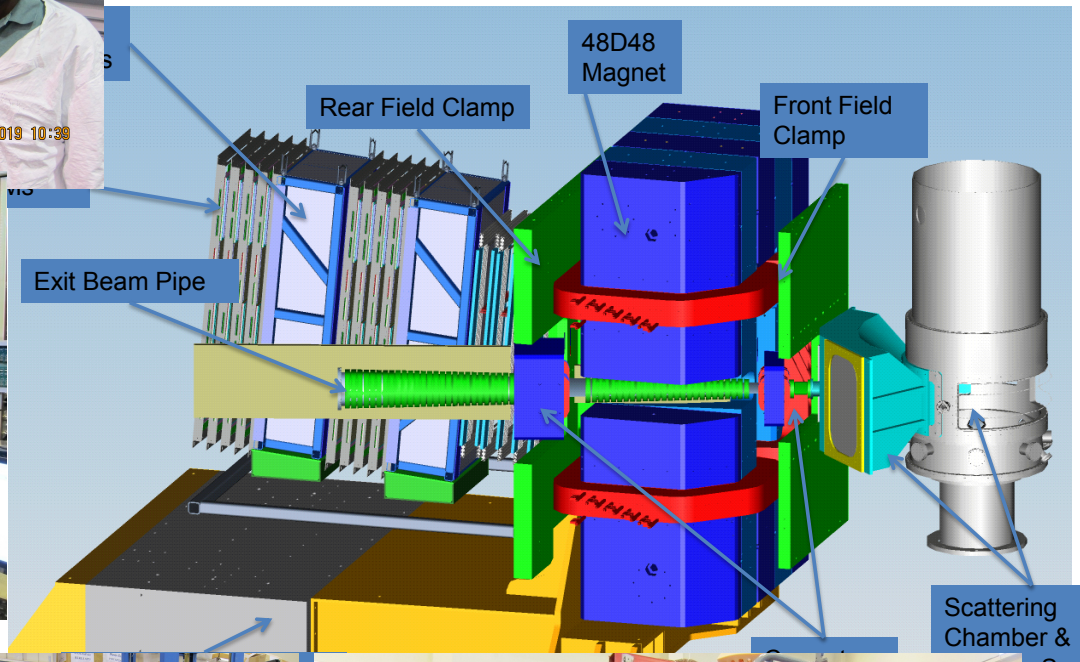

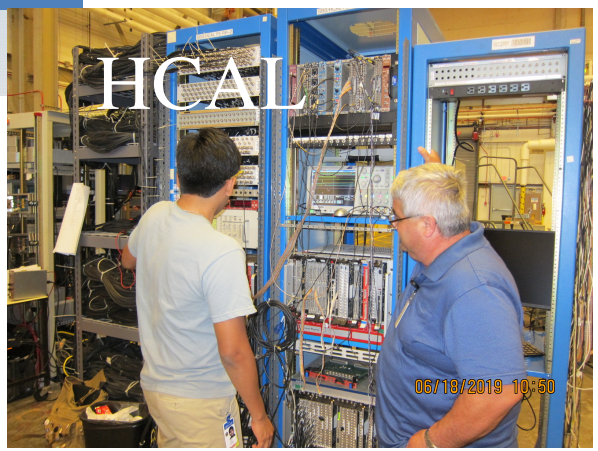

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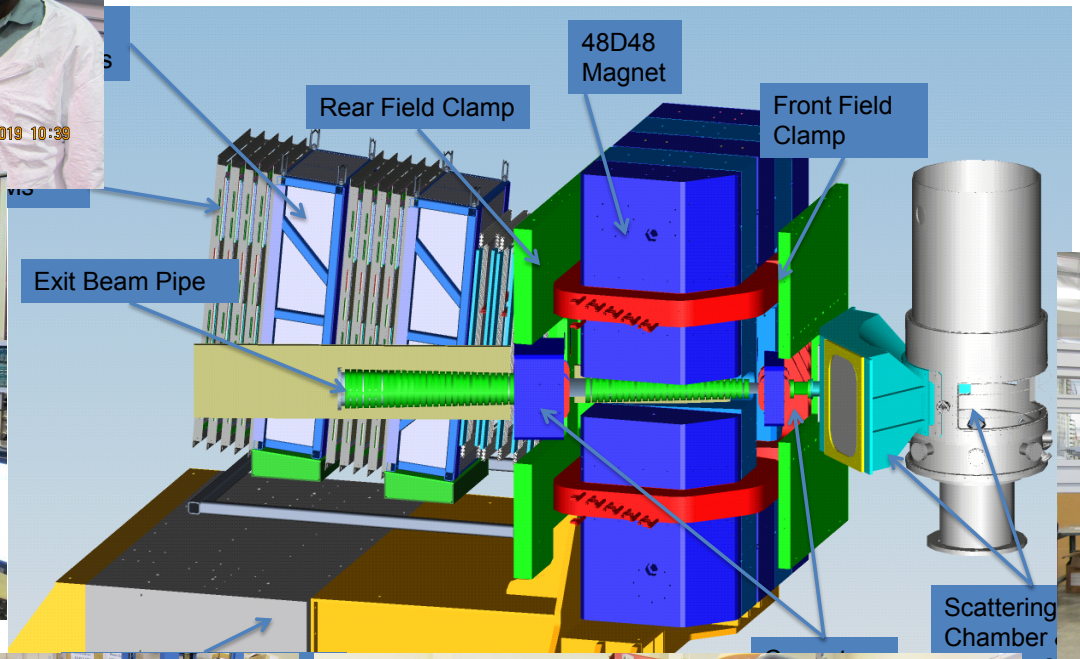

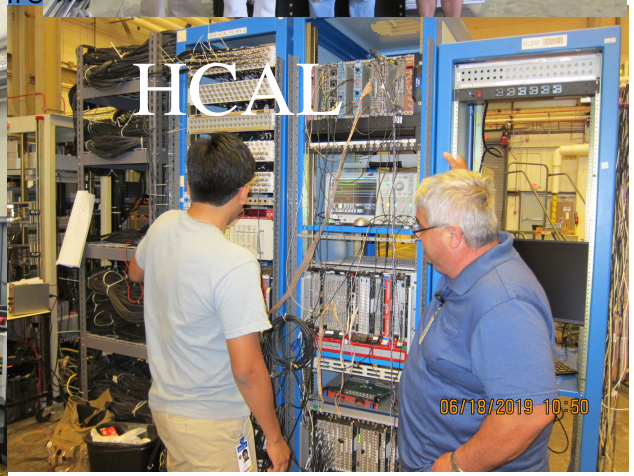

Looking Towards 2020: All Major SBS Components Now at JLab

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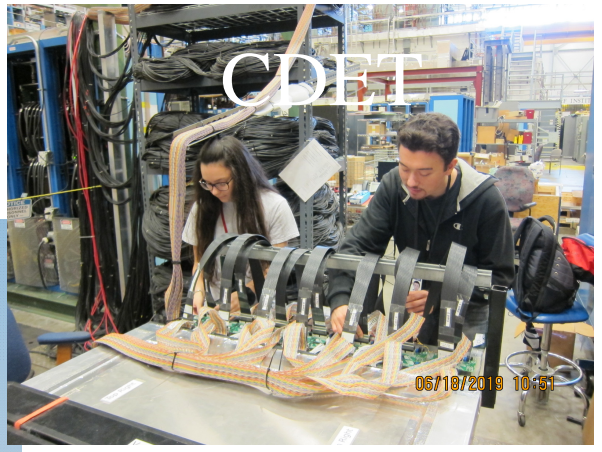
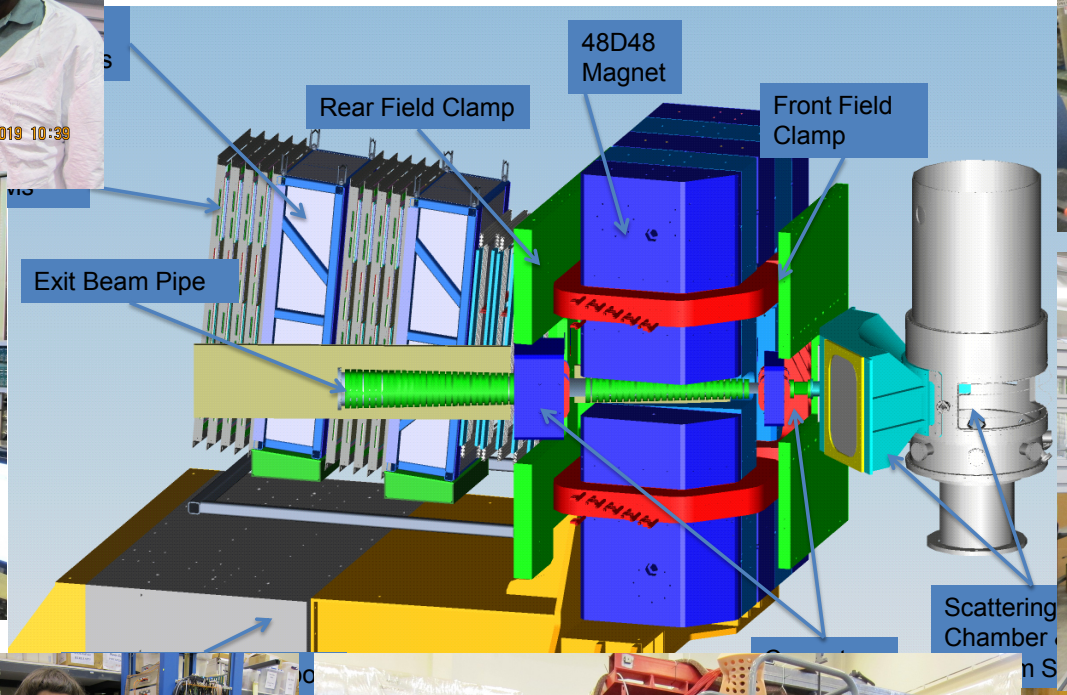
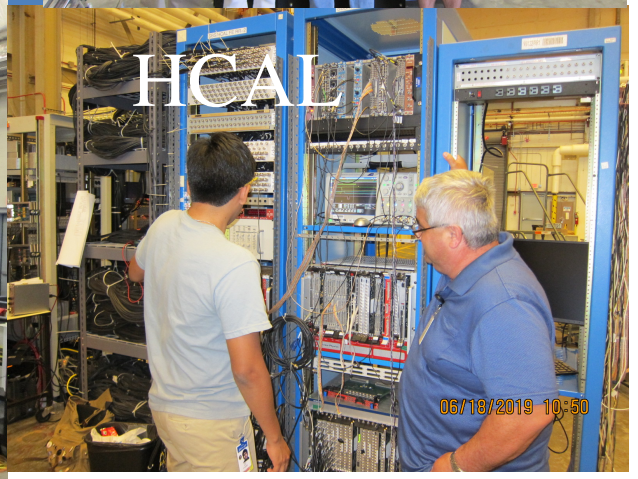




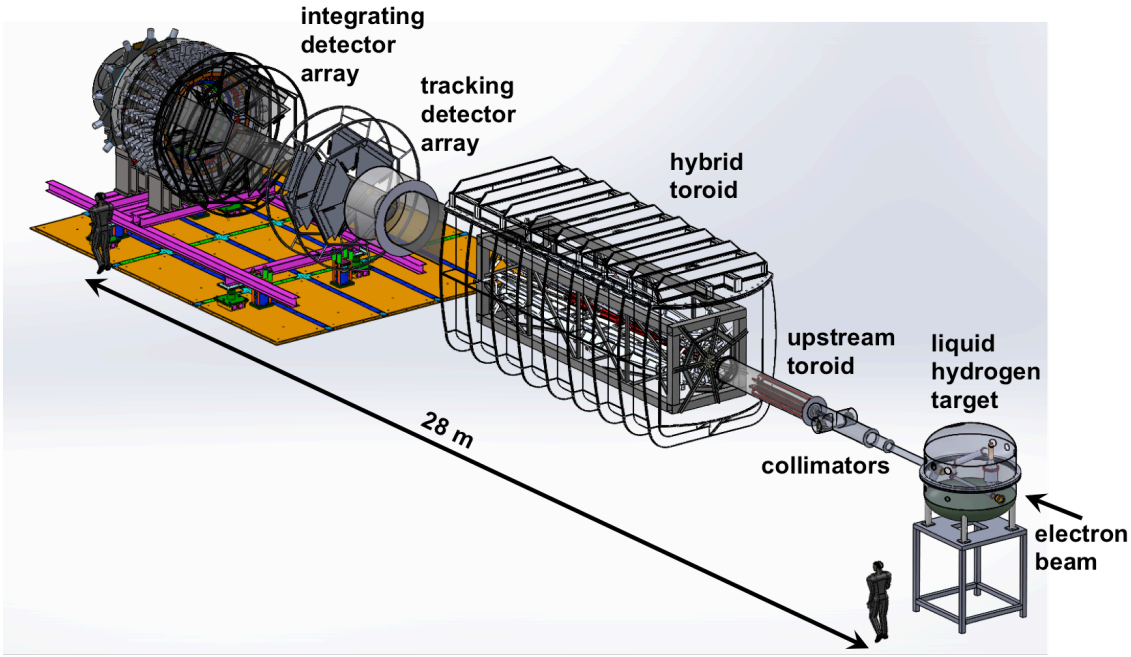


MOLLER Status/Timeline

- 2014 DOE Science Review
- 2016 Director's Technical Cost and Schedule Review
- CD-0 [12/2016 – 1/2017] currently still frozen
- April 2019 Director's Review
  -12 Recommendations, in addition to many from previous reviews

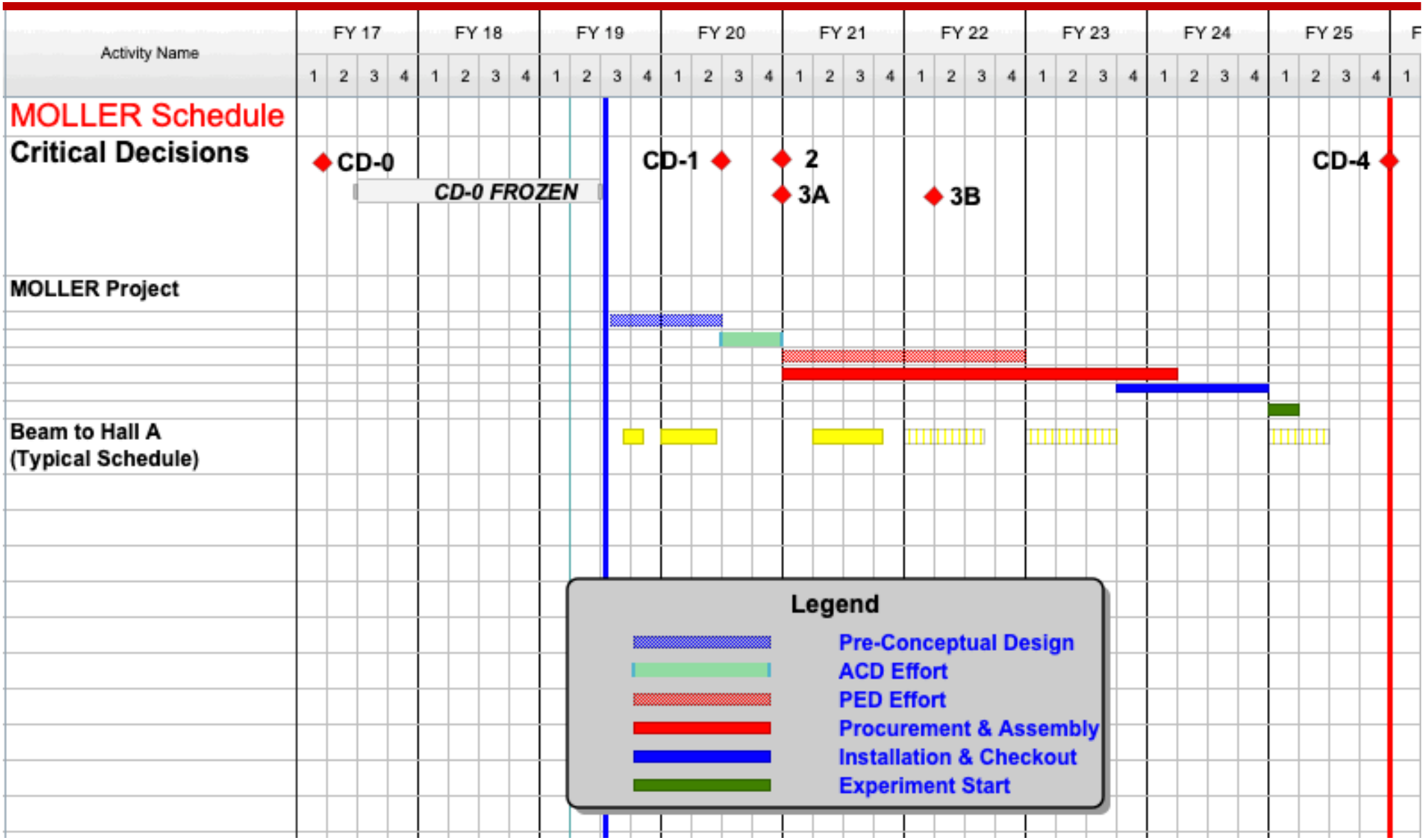
- Work proceeding to address recommendations from Reviews
- In all, 98 Recommendations and Comments are being tracked
- Pre-R&D continues to refine design choices and reduce risk

- Project management organization
- Spectrometer magnet and collimator systems conceptual design
- Hall infrastructure requirements
- Parity quality beam working group
- Polarimetry upgrades
- High power target development
- Continued detector development

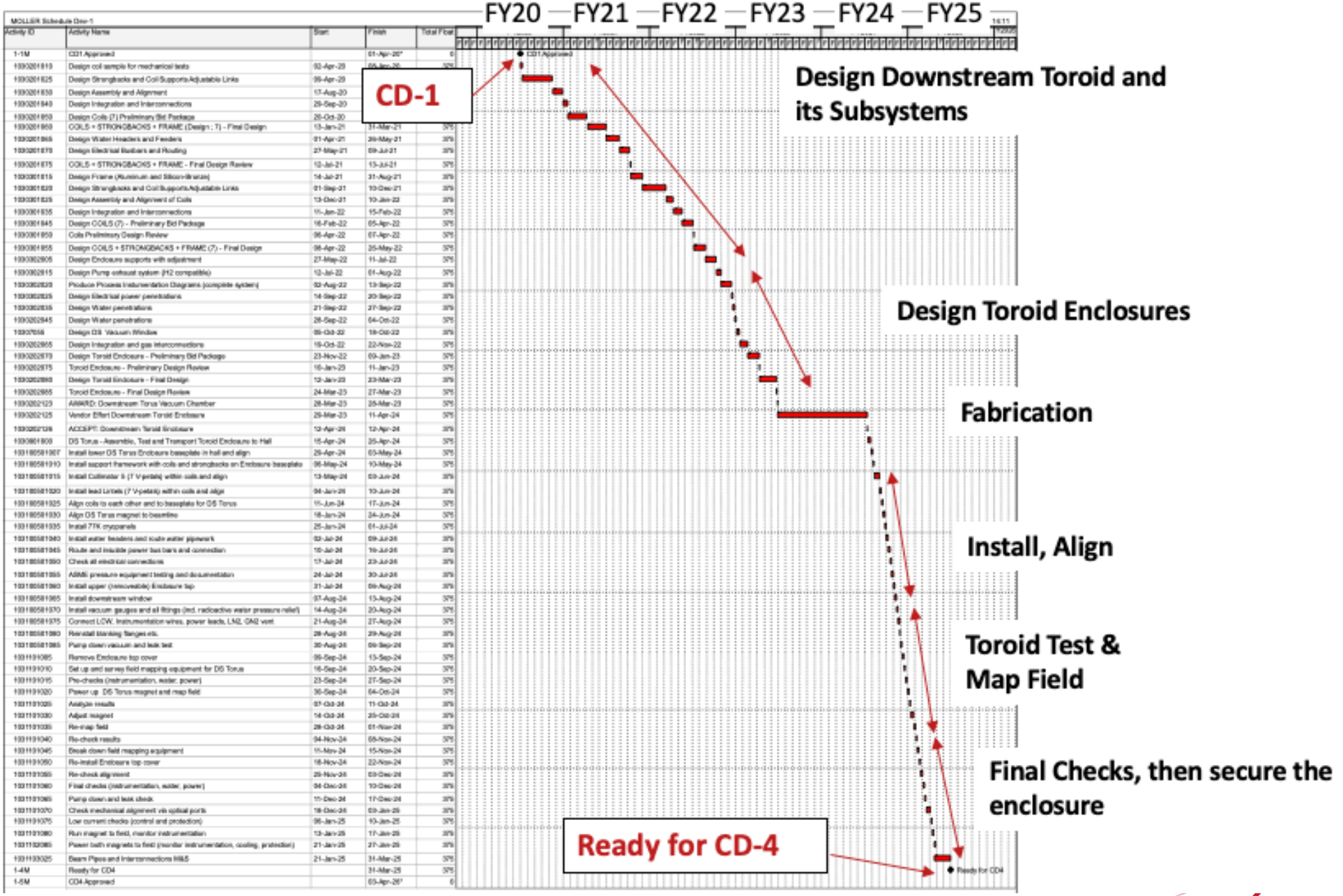


Draft a Plan

MOLLER High-Level Project Schedule --DRAFT--

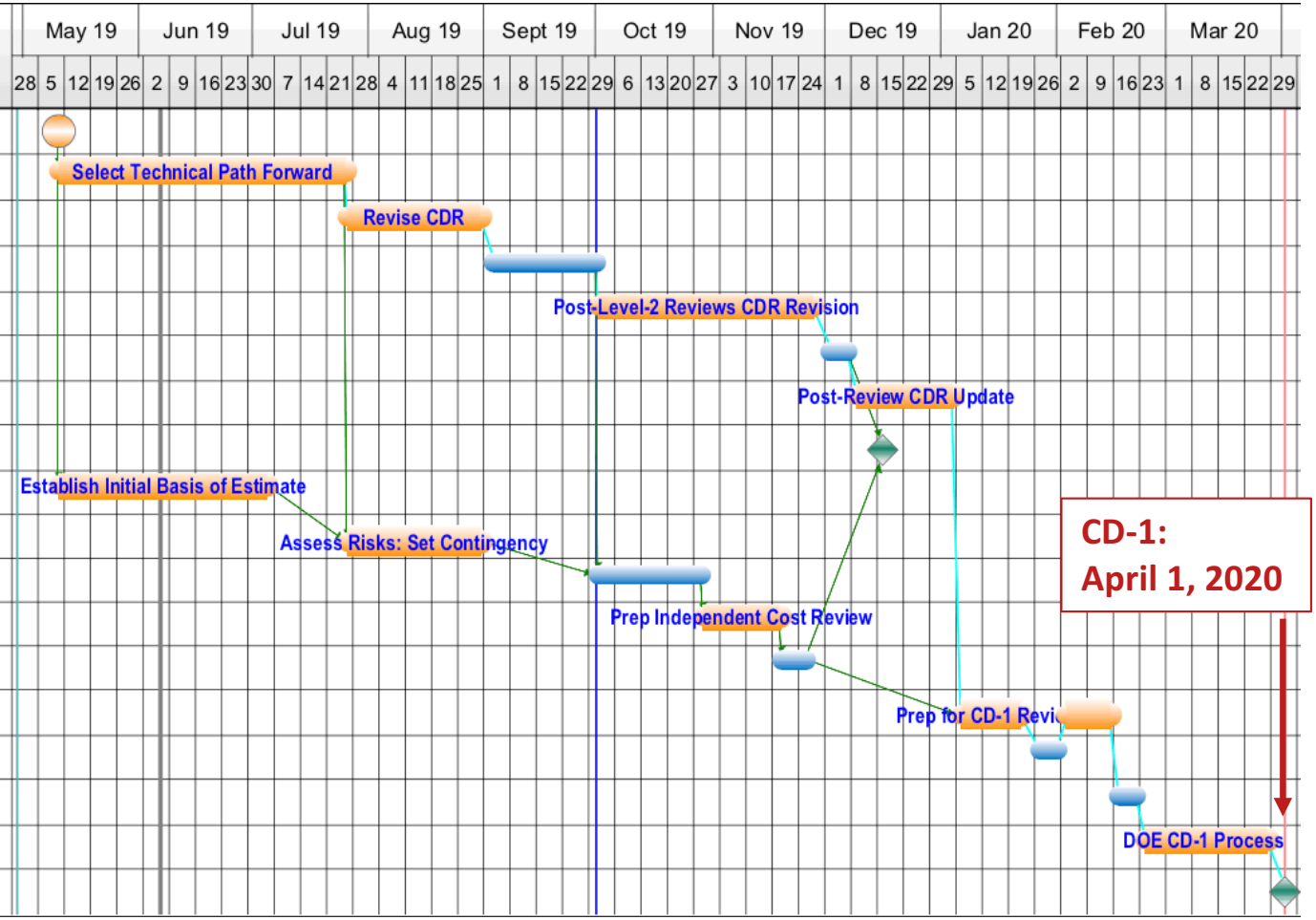


Project Critical Path



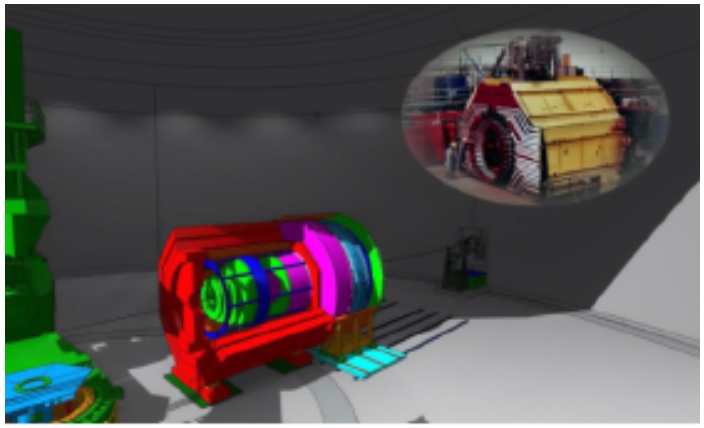
MOLLER: "Here to CD-1" Schedule for achieving CD-1

Activity Name	Resources Assigned
Start	
Select Technical Path Forward	Collaboration
Revise CDR	Collaboration
Level-2 Technical & Safety Reviews	CAMs, Collaboration
Post-Level-2 Reviews CDR Revision	Collaboration
CDR Review	CAMs, Collaboration
Post-Review CDR Update	Collaboration
NSF Proposal Due	Collaboration
Establish Initial Basis of Estimate	CAMs
Assess Risks: Set Contingency	CAMs
Level-2 Cost & Schedule Reviews	CAMs
Prep Independent Cost Review	CAMs
Project Independent Cost Review	CAMs
Prep for CD-1 Review	CAMs, Collaboration
Director's Pre-CD-1 Review	CAMs, Collaboration
CD-1 Review	CAMs, Collaboration
DOE CD-1 Process	
CD-1 Approval	



MOLLER Collaboration and JLab Project Team are working to this schedule.

SoLID Status Update

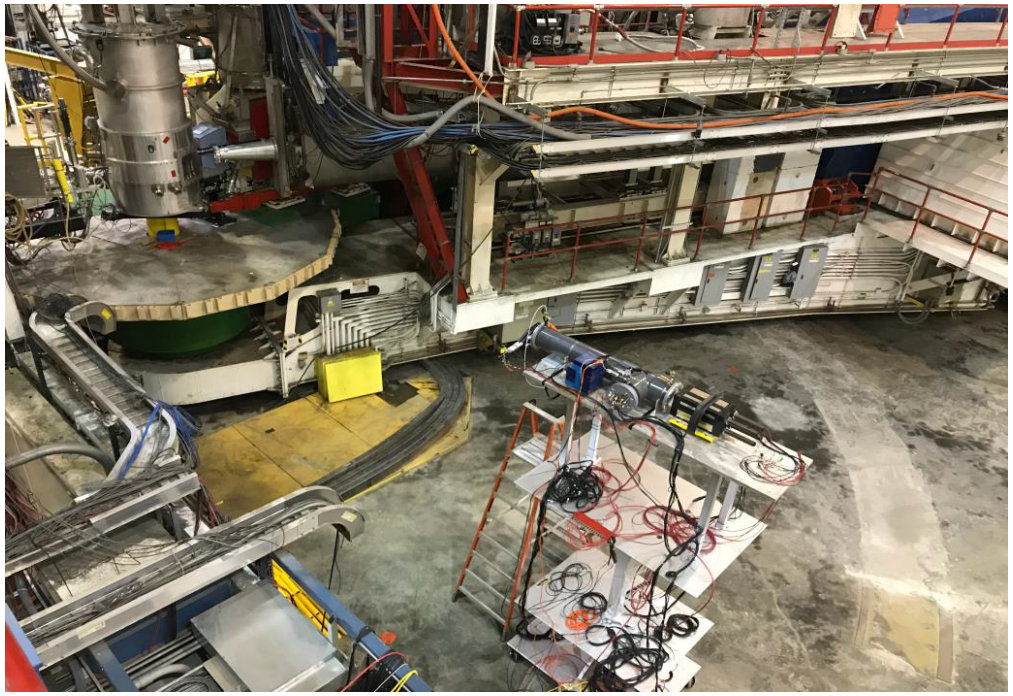


- **Met with DOE on June 2018**
  - Presented the updated pCDR addressed Review Committee comments
  - Presented the proposed schedule/timeline and pre-R&D plan
  - Request to have a DOE Science Review - DOE satisfied with the progress. Asked for a new cost estimation before scheduling Science Review.

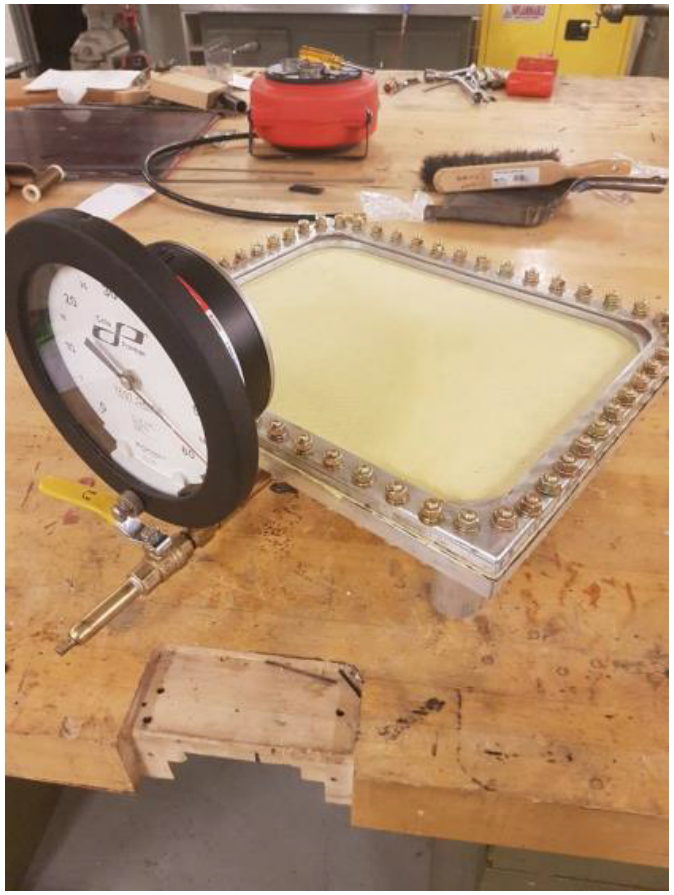
- **Completed Cost Estimation Update and Updated pCDR**
  - Working on detailed Work-Breakdown Structure (WBS) and dictionary
  - Preparing for a Director's Review (of SoLID Cost) ***this August 2019***

- **Continue Pre-R&D on Sub-systems and Simulations**
  - Magnet yoke steel arranged to arrive in July, prepare magnet test
  - Study GEM readout, effect on tracking
  - ECal fiber testing
  - LCG background test with prototype, mirror study
  - HGC simulation on performance with different options, gas system, window test

Light Gas Cherenkov Prototype Test Setup in Hall C



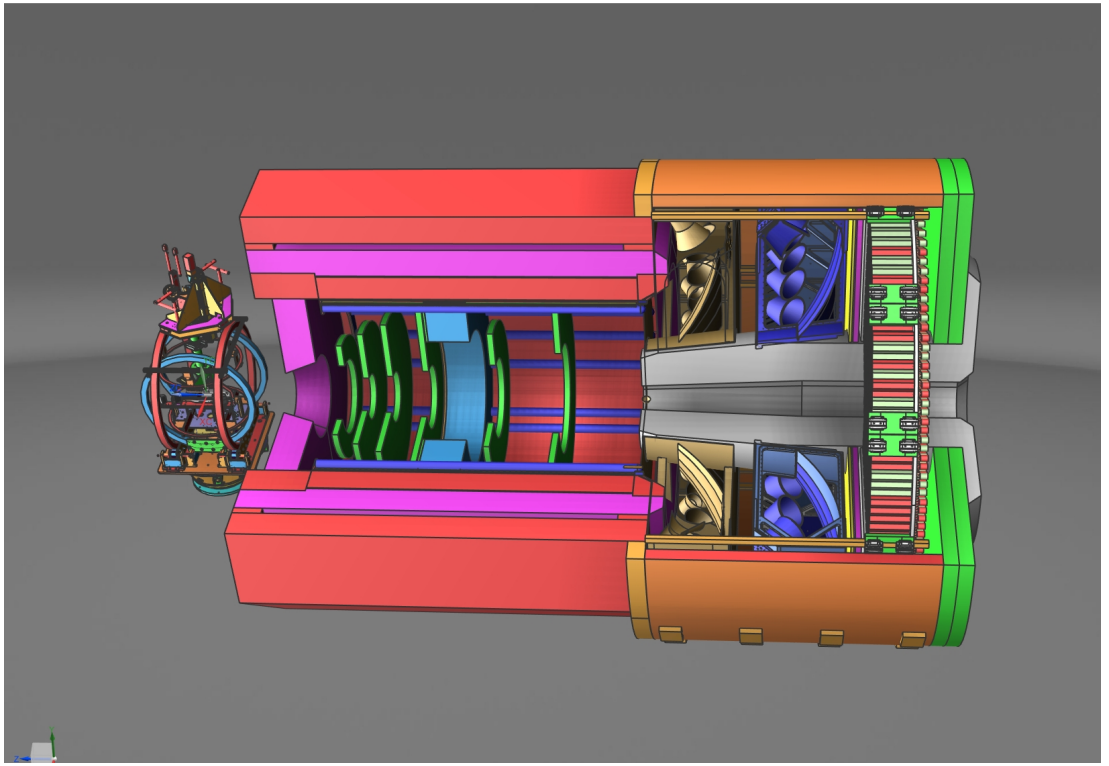
Heavy Gas Cherenkov Window Test



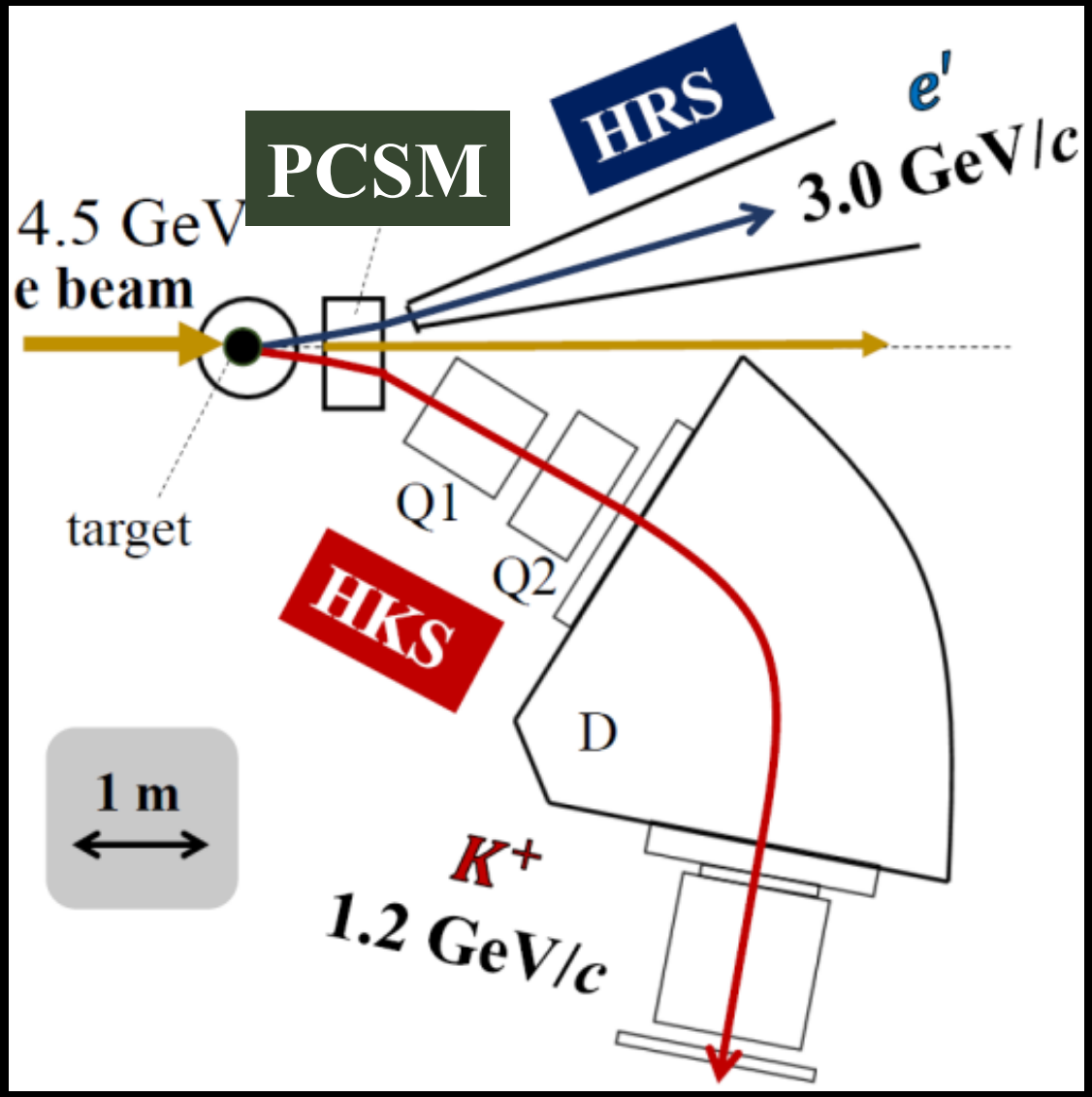
ECal Module (Shashlyk) Prototye Test

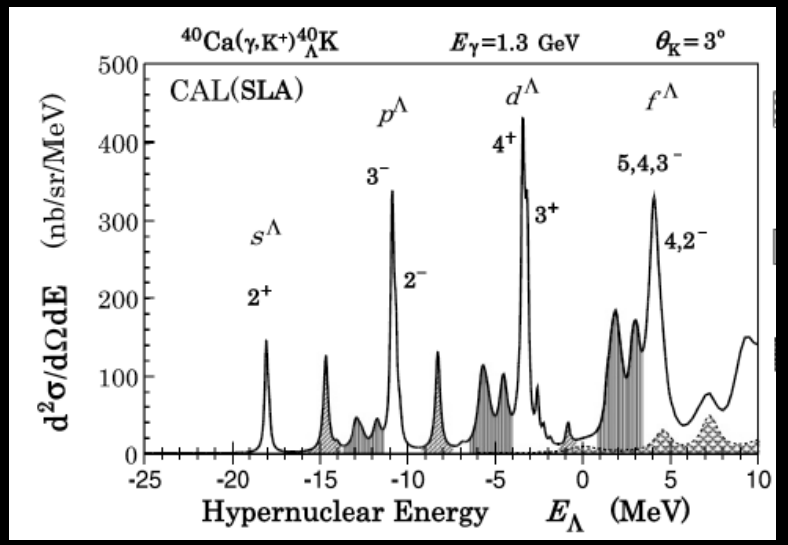
SoLID at JLab

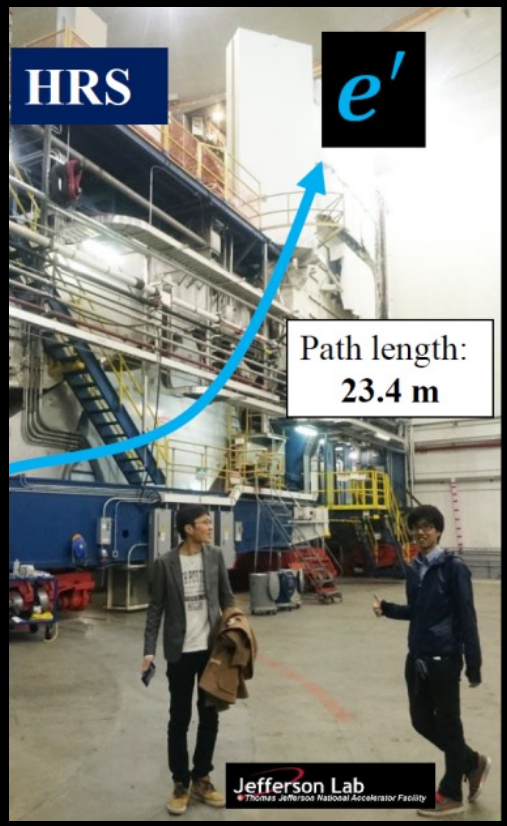
- Engineering and design
- Magnet preparations
  - Looking towards cold test
  - Instrumentation and controls (reduce highest schedule risk)
  - Cryo reservoir
  - Static testing
- Data acquisition
- Remainder of CLEOII steel to *arrive this month!*
- Software development
- Polarized ^{3}He target development
- Polarimetry and parity quality beam
- Magnetic field analysis
- Project planning



Hypernuclear Spectroscopy







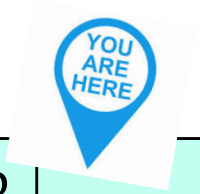
Ready by 2021

New PCSM (Pair of Charge Separation Magnets)
Ca target holder design/construction started

Hall C

Hall C Projected Experiment Schedule

CHL down

	CY Spring 2018	CY Fall 2018	CY Spring 2019	CY Summer 2019	CY Fall 2019	CY Spring 2020	CY Spring 2021
Phase I (27 days, F2) + start Phase II Commissioning "Experiment" (SIDIS)							
Phase II Commissioning (SIDIS + kL/T + CSV)			+ LHCb 5q	+ VCS			
Commissioning complete: all Hall "capabilities" tested *with physics*					A_1^n d_2^n	A_1^n d_2^n	
High Impact Experiment(s)? – and more?							(x>1) (πFF) *DVCS?*

- Experiments in parentheses in chart are anticipated to be ready and potentially appropriate for the indicated time slot(s), potential options ***in no particular order.***

A_1^n / d_2^n (E12-06-110, E12-06-121)

Preparing for late CY 2019 - Goals:

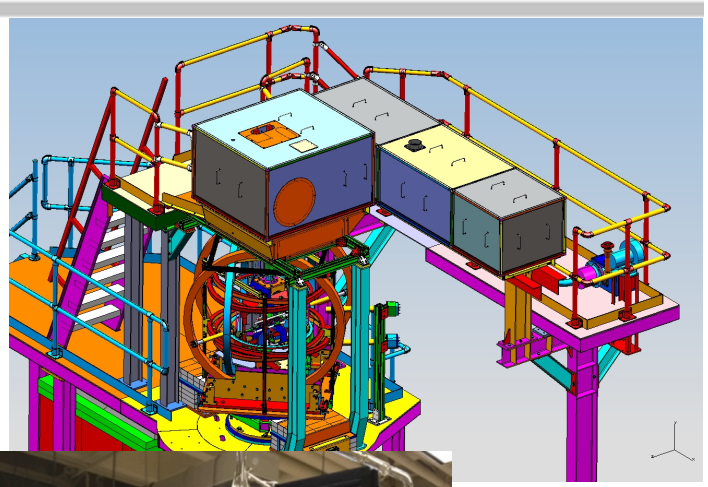
30 uA on 40 cm , ~10 atm, $\mathcal{L}$ ~ 2.2×10^{36} $cm^{-2}s^{-1}$

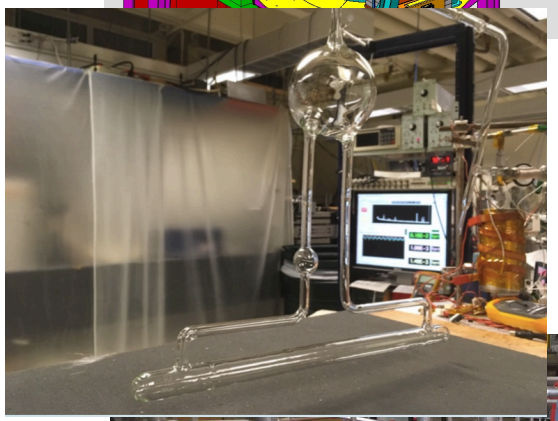
In-beam polarization ~ 55-60%,

Polarization measurement precision ~ 3%

- Design complete.
- Fabrication of parts (platform, supports, target) in progress.
- Lasers and fibers in hand.
- Instrumentation working.
- EPR and Pulse NMR (new) polarization measurements working.

Target cell production has been challenging.
Reacquiring know-how after 10 year hiatus.
Production/filling now at W&M and UVA,
testing/characterization at JLab and UVA.
2-3 usable cells in hand.

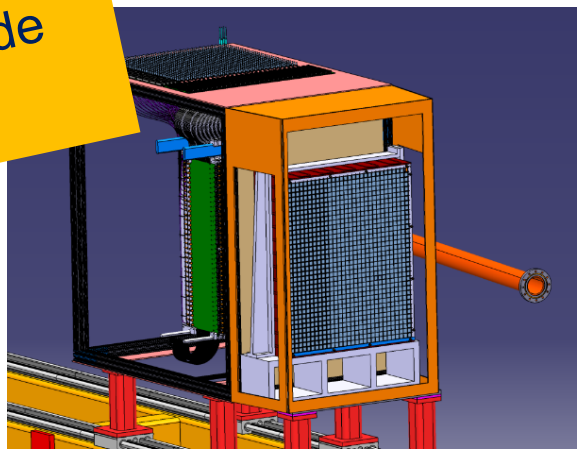


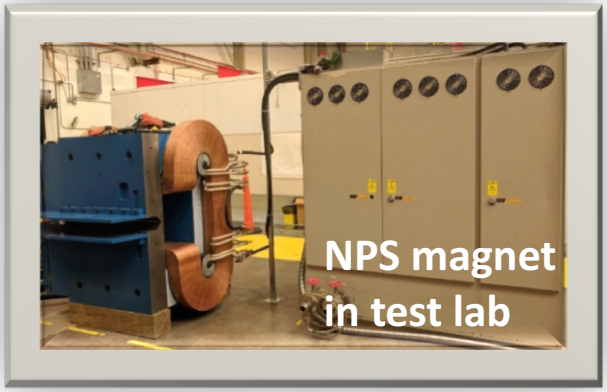


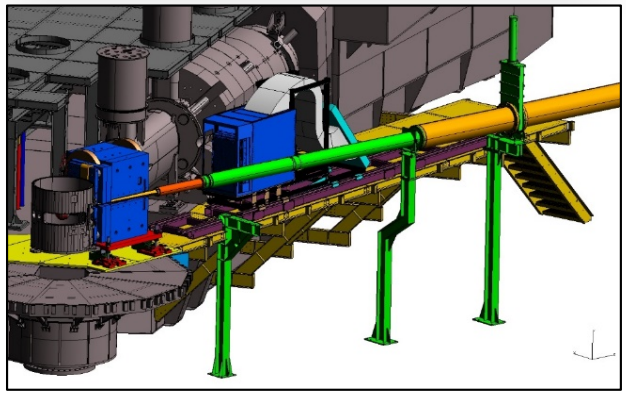
Neutral Particle Spectrometer (NPS)

- NPS passed ERR with recommendations
  - Experiments: E12-13-010/007, E12-14-003/005
- NPS 12x12 prototype test successfully completed
- NPS subsystem status
  - Magnet provided by CUA and ODU (NSF MRI) - ready for mapping

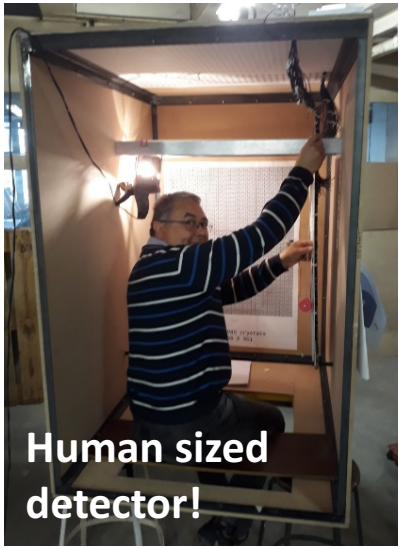
See Rolf Ent, Julie Roche, Charles Hyde talks!





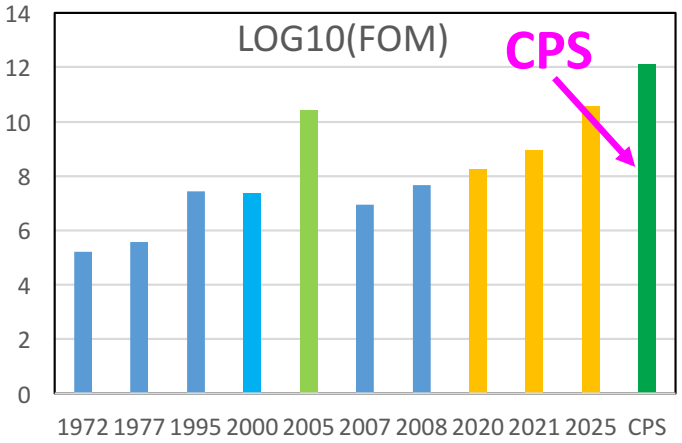


- Detector frame designed (IPN-Orsay)
- Crystal testing ongoing (CUA), final procurement underway
- PMTs on-site, HV base fabrication near completion (OU)
- Software development ongoing (IPN-Orsay, JMU, U. Glasgow, JLab)
- Trigger/Electronics/DAQ - (JLab)



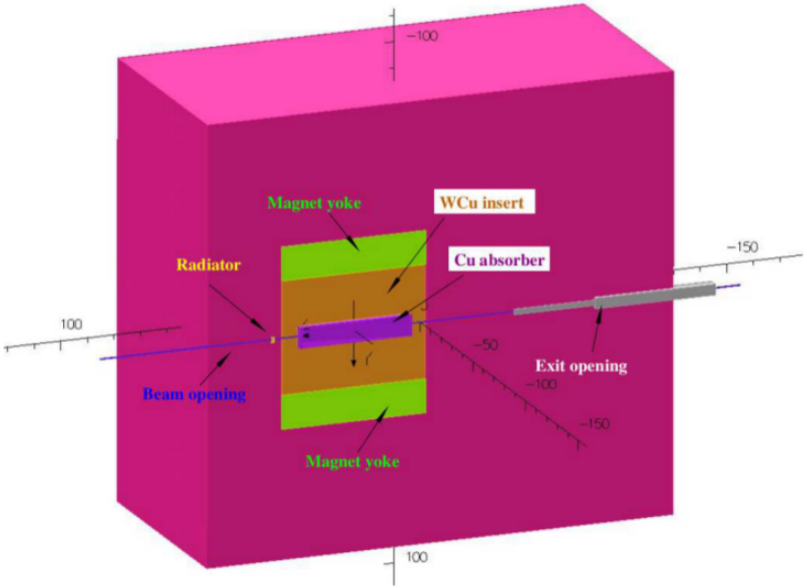
- Mechanical – systems identified, e.g. SHMS platform extension designed, installation plan being developed and tuned (Jlab)

New instrument: Intense Collimated Photon Source for use with Dynamically Polarized Solid-State Targets



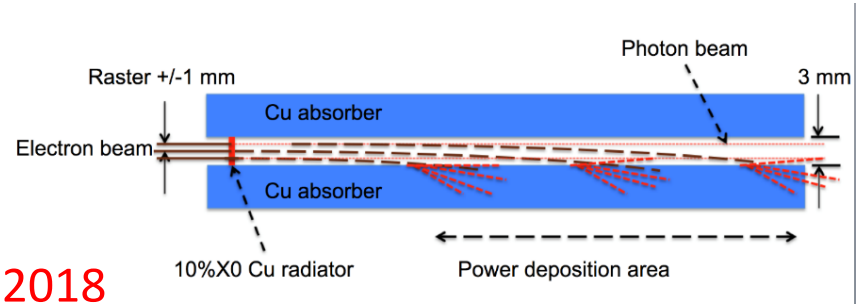
Unique Science – gain in FOM = 30

High-energy photoproduction in 3D dynamic proton structure
– **two experiments at JLab to date and additional ideas**



Compact Photon Source (CPS) Concept

- Combines in a single shielded assembly all elements necessary for the production of high-intensity photon beams and ensures that the operational dose rates are acceptable
- Features: magnet, central Cu absorber to handle power deposition, W powder and borated plastic to shield induced radiation dose
- Mechanism: electrons interact with radiator creating photons; electrons dumped in magnet; photons escape thru small collimator w/out loss of intensity



CPS concept successfully passed a Technical Review in 2018

LAD – Large Acceptance Detector

E12-11-007: Deuteron EMC – d(e,e' backward p)

Very large solid angle for $L = 10^{36}$ cm^{-2} s^{-1} and $\theta > 90^{o}$

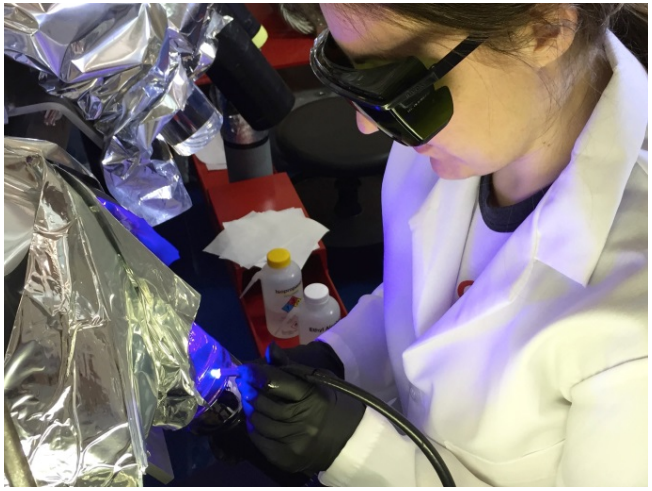
Optimized for medium momentum nucleons

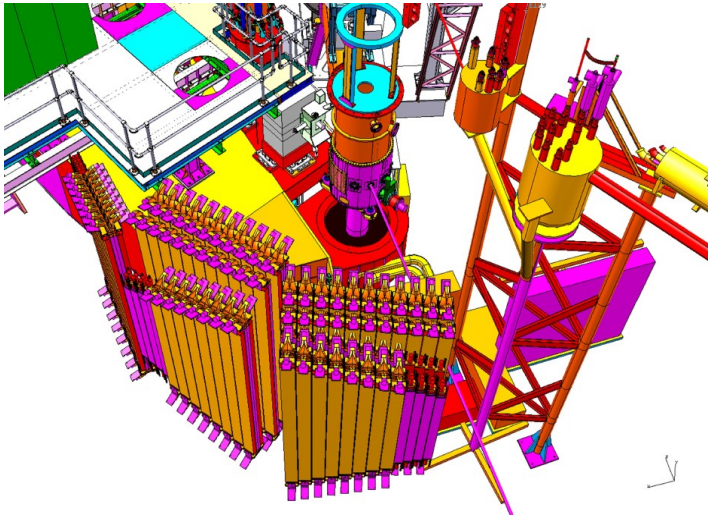
$$0.3 \leq p_N \leq 0.7 \text{ GeV}/c$$

Needs 5 scintillator planes from old CLAS-6 TOF refurbished @ODU by ODU, KSU, TAU, MIT, GWU – now back at JLab

Will include PRad GEMs (UVA joining)

Plan to schedule an ERR during 2019.





Or: "..we're ready and excited!"

NIM Article on SHMS

Brad Sawatzky and Howard Fenker organizing technical description of the SHMS spectrometer (Nuclear Instruments & Methods in Physics Research)

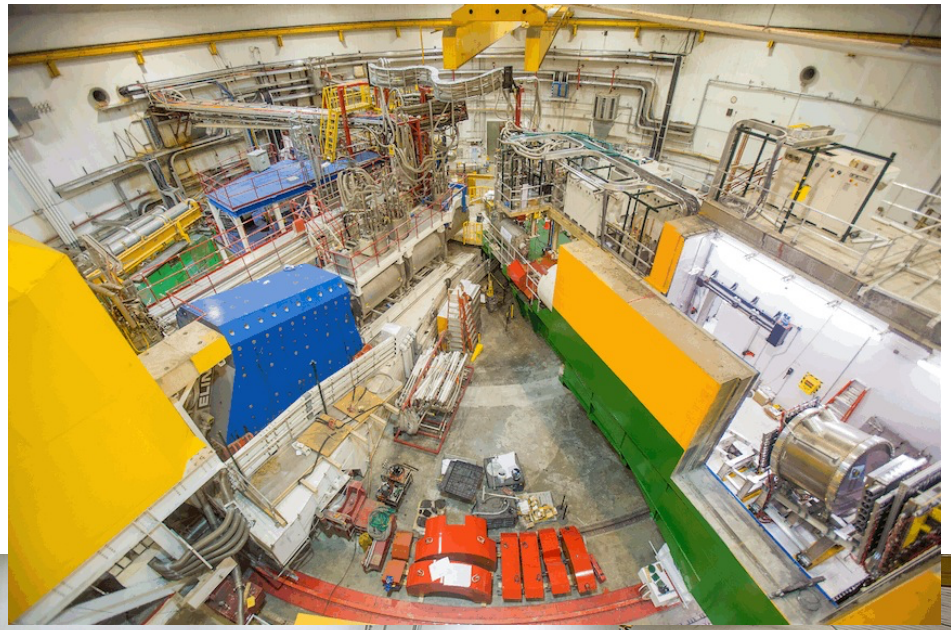
Writing assignments have been made, *but all help is welcome!*

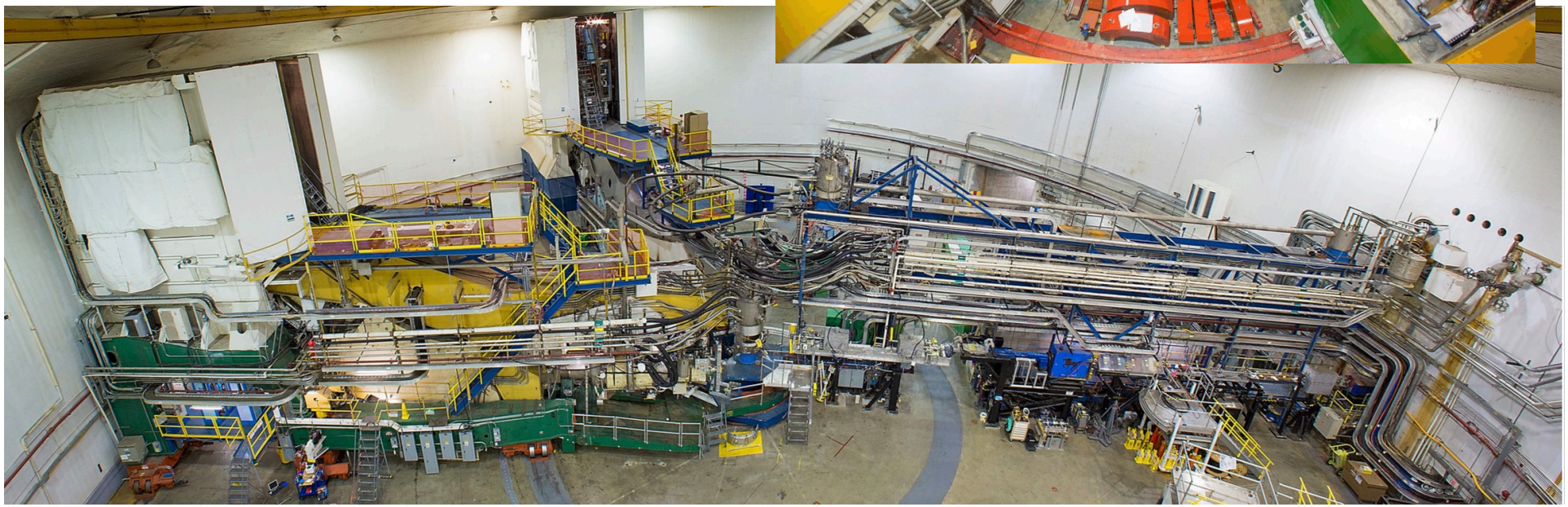
Draft document available online at

https: // userweb.jlab.org/~hcf/shmsnim/

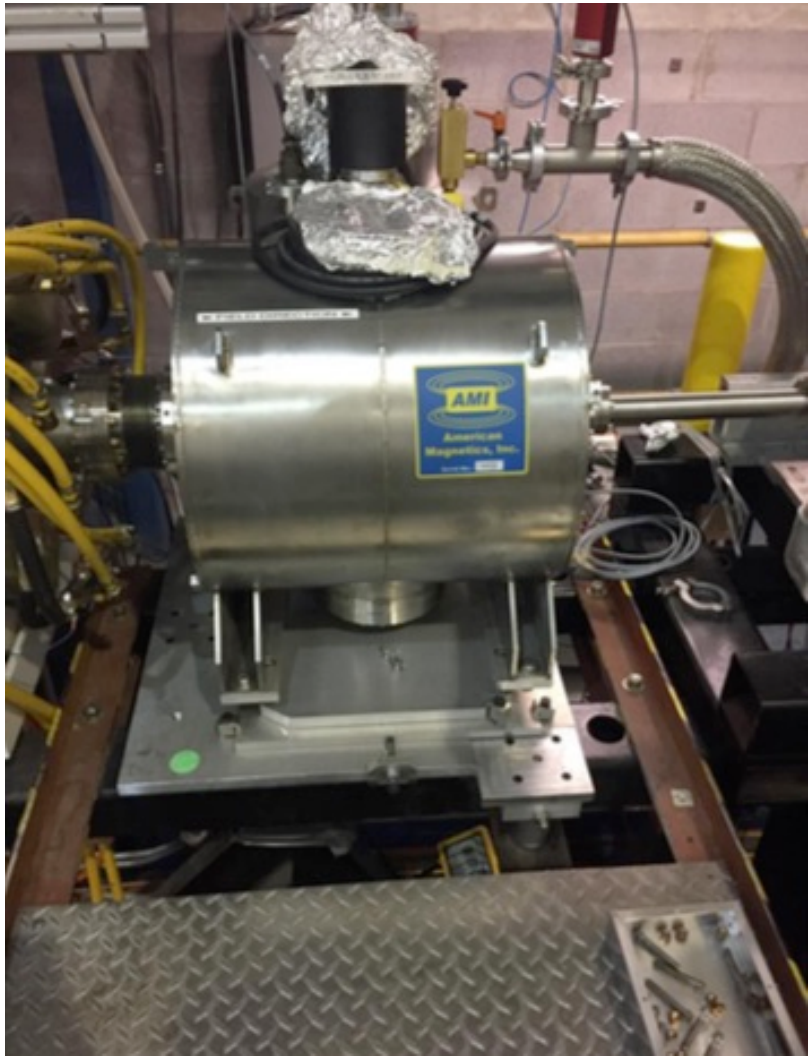
NOTE: Other than adding Brad, this is the same slide from last summer's Collabration Meeting – please *don't make me show it next time!!*

Back to
A and C:
Other
Happenings



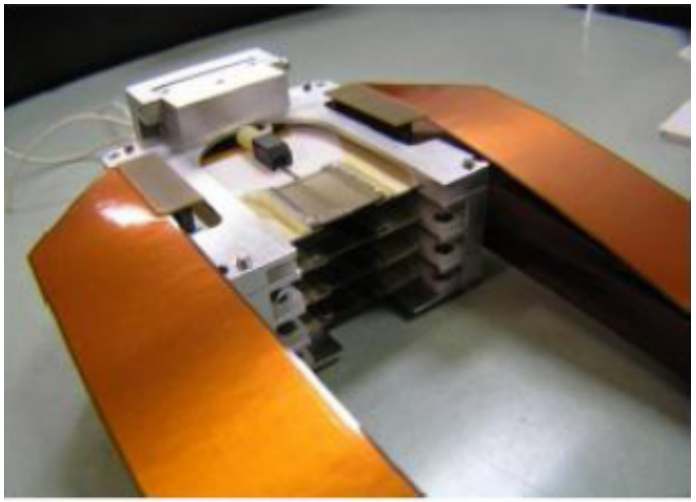


Other Happenings I: Polarimetry



Working towards common (or, well, as much as reasonably common) Hall A/C polarimetry

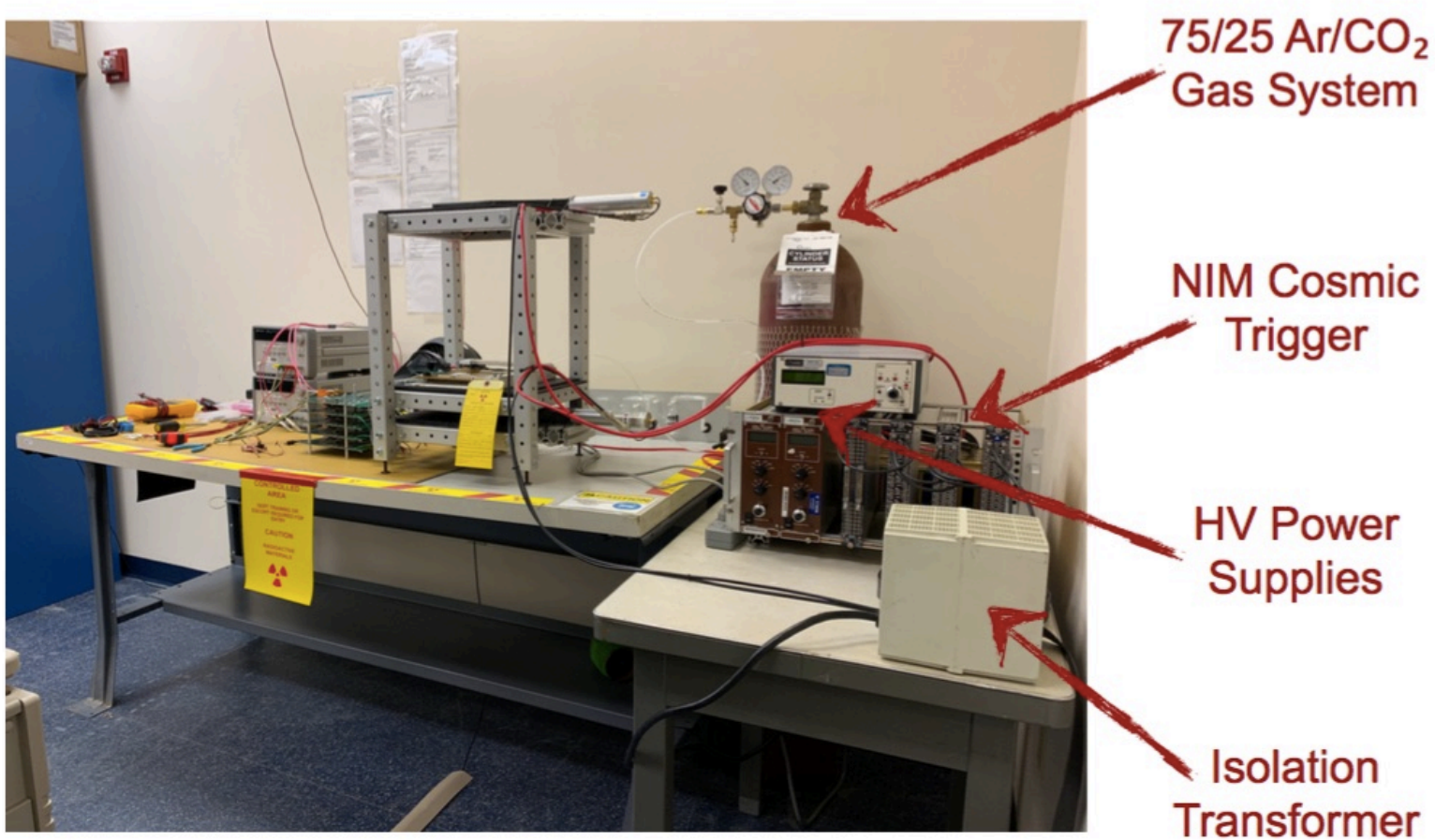
- New Hall C MOLLER superconducting target magnet
- New MOLLER target ladders for Halls A and C
- Compton capital equipment project launched to facilitate cross-hall compatibility and ability to achieve high precision (MOLLER)
  - Diamond detectors for Hall A?
  - Laser for Hall C?
  - Upgraded electron detector DAQ for Hall C (VTROC)



Other Happenings II: Streaming Readout Development

TDIS (and SoLID and EIC and beyond…) high rate GEM test stand

- GEM ➛ x and y plane (324 channels each)
- TRORC ➛ ALICE/ATLAS readout receiver card with GBT serialization protocol
- FEC➛ALICE front end card(Jlab version) – 5 SAMPA chips (160channels)



Other Happenings III: ESR-2

- In the 12 GeV era loads are already above the actual ESR capacity ➔ need for an upgraded End Station Refrigerator complex
- ESR2 will be connected to the existing ESR1 building and the current cryogenic distribution system
- ESR2 Complex:
  - 4 x Warm Compressors
  - 4.0 kW @ 4K Cold Box
  - CBX Distribution
  - LHe Storage

ESR-2: Project Overview Budget and Schedule

- ESR 2 building was Completed in December 2010
- Project funds of 9.9M$ awarded – April 2018
- Project funds rescinded in June 2018
- Funds may be re-awarded in FY2019 or FY2020
- PEP (Project Execution Plan being written)
- Received some internal funding to start design work

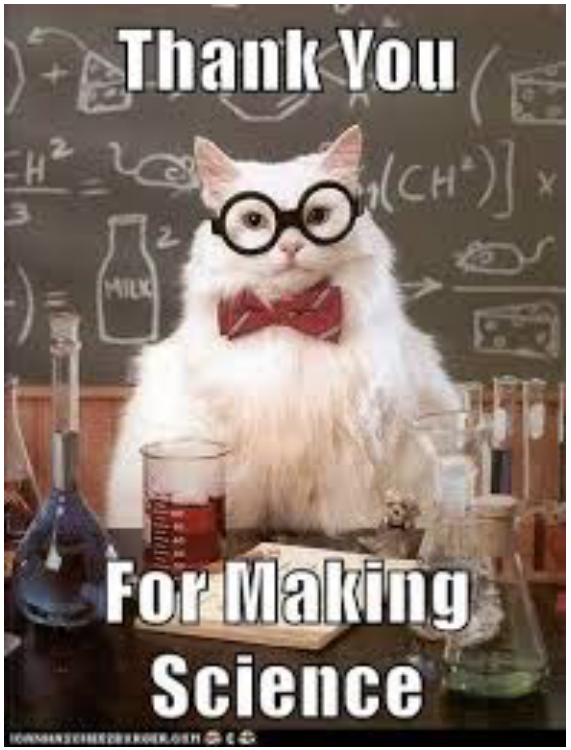
The Hall A/C Outlook is Positive!

- Data for parts or all of **19** experiments (9(A) + 10(C)) obtained!
  - Theses and publications *(please!)* to come
- We ran more experiments than initially planned
  - APEX best effort successful
  - J/Psi 5q *added*
- We are running PREX2/CREX
  - Summer 2019 VCS color polarizabilities *added*
- We are prepared for A_1^n/d_2^n installations
- SBS GMn and Gen-RP are on track for 2020 installation
- NPS, CPS, MOLLER, SoLID, more… also progressing well

Party this eve!

All are invited! Directions on back coffee table.

Thanks



To EVERYONE for the expertise and dedication to get us here, and also to those who provided materials for this talk