NPS ERR

"Apparatus ownership, maintenance and control, safety documentation, radiation levels"

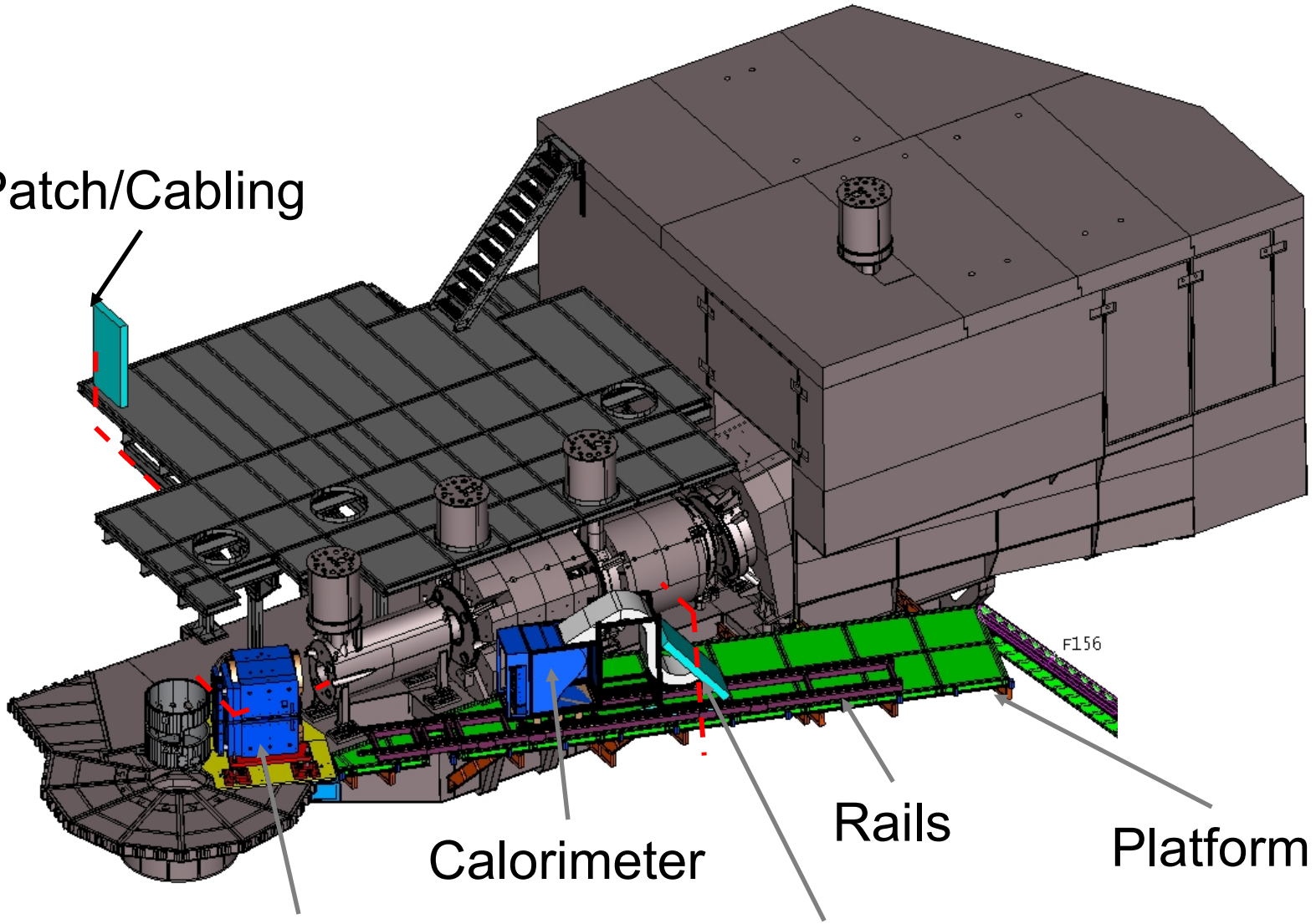
Charge items covered:

4. Has the entire beam line, spectrometers, detector configuration been defined, including ownership, maintenance and control during beam operations?

5. Are the responsibilities for carrying out each job identified, and are the manpower and other resources necessary to complete them on time in place?

7. Are the radiation levels expected to be generated in the hall acceptable? Is any local shielding required to minimize the effects of radiation in the hall equipment?

9. What is the status of the specific documentation and procedures (COO, ESAD, RSAD, ERG, OSP's, operation manuals, etc.) to run the experiments?


Patch/Cabling
F156
Calorimeter
Rails
Platform
Sweeper Magnet
+ base plate
Patch/Cabling

Beamline

Charge Items 4, 5 – Scope (1)

Infrastructure: (See S. Lassiter talk)

- SHMS HB removal
- Sweeper magnet support
- Extended platform + stairs for small angle running
- Calorimeter support and rail system
- Beamline modifications
- Radiator (for Wide Angle experiments:E12-14-003/E12-14-005)
- Cable patches

Sweeper magnet: (See C. Hyde talk)

- Assembly
- Testing and mapping
- Power supply and LCW

Charge Items 4, 5 – Scope (2)

Calorimeter: (See C. Munoz-Camacho talk)

- Crystal Procurements
- Crystal testing and selection
- Detector frame
- PMTs, sockets, dividers, preamps
- Signal distribution cards, cabling, LED fibers

DAQ, controls, analysis software (See. B. Sawatkzy talk)

- Trigger, data acquisition, firmware updates
- Controls (HV, LED, temperature)

Software (See G. Niculescu talk)

- Simulations
- Low level software (unblocking, decoding)
- High level software (calorimeter, physics)

Infrastructure

Infrastructure (HB removal, platform, supports, beamline, cable runs) fully defined (according to experiment requirements) with detailed 3D CAD models. (Well beyond conceptual.)

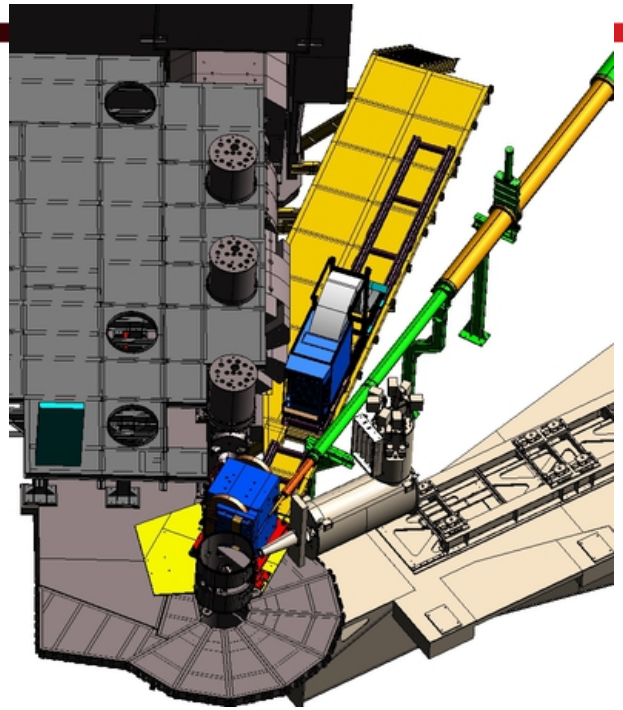
Most items will be ready for procurement in FY20.

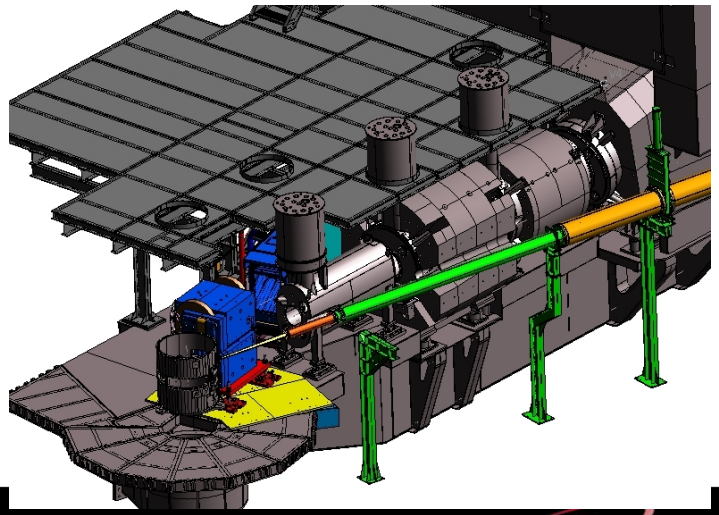
JLab Hall C technical groups are “owners” and are responsible for design, procurement, installation and maintenance.

HB removal and installation of infrastructure, detector and magnet - 2 months.

Radiator exists (Used for LHCb pentaquark). “Owned” by JLab target group.

Cable patches “owned” by Hall A/C spectrometer support group.





Sweeper magnet

Sweeper magnet funded by CUA/ODU (MRI).

At JLab and fully assembled in Test Lab (Hall C technical groups.)

ODU responsible for testing and mapping.

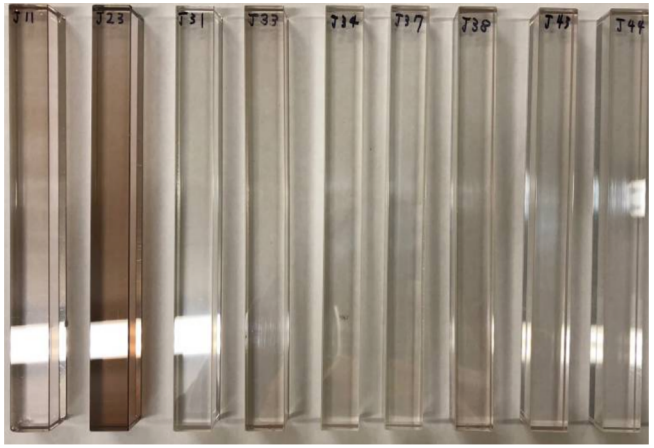
Spectrometer Support group responsible for power, water and controls.

Several Hall A/C supplies compatible with magnet. Hypernuclear spectrometer supply used for testing. Two supplies needed for operation of main coil and compensation coil. Will choose from inventory of Hall A/C supplies.

During run, OSP authorizes users to operate magnet

Calorimeter - 1

Overall, detector is defined, owned, maintained and operated by the collaboration. Various institutions are responsible for acquisition/construction of various parts.



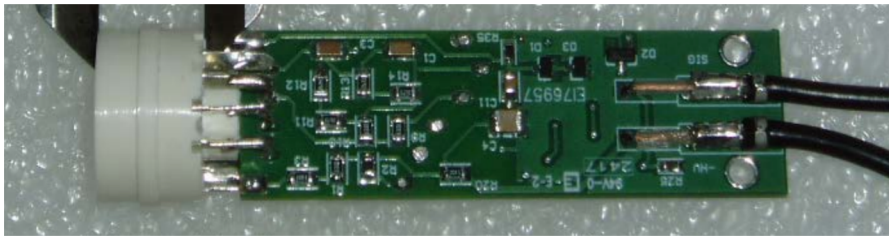
Concept: Yerevan

Crystals: JLab procuring for benefit of NPS and Hall D. Enough (of varying quality) in hand, but more higher quality crystals being procured to optimize NPS performance. (By summer 2020)

Crystal Testing and Selection: CUA and Orsay

PMTs: On order by JLab. Several hundred on hand. Delivery summer 2019.

Voltage dividers (bases): In fabricated at Ohio U. 80% made and testing in progress.

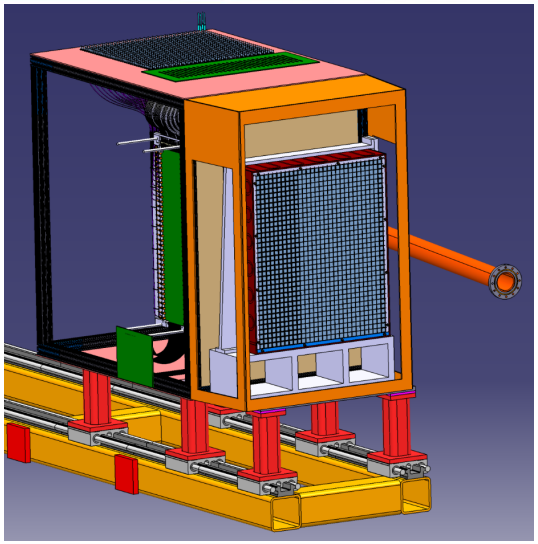


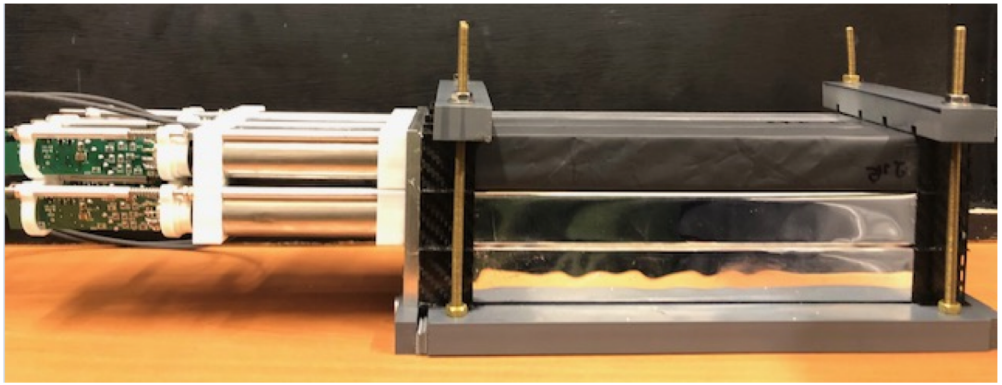
Calorimeter - 2

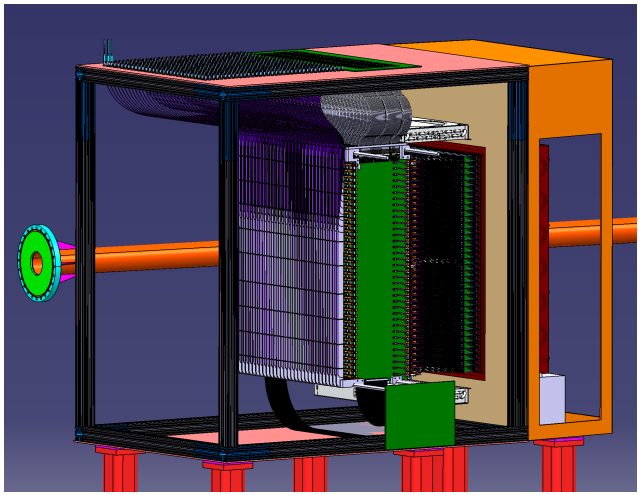
Detector frame: Hold crystals/base assemblies, preamps, signal routing boards, cables, fibers for LED light distribution. Design and fabrication at Orsay.

Distribution boards, first article in May.

Frame delivery to JLab by summer 2020.







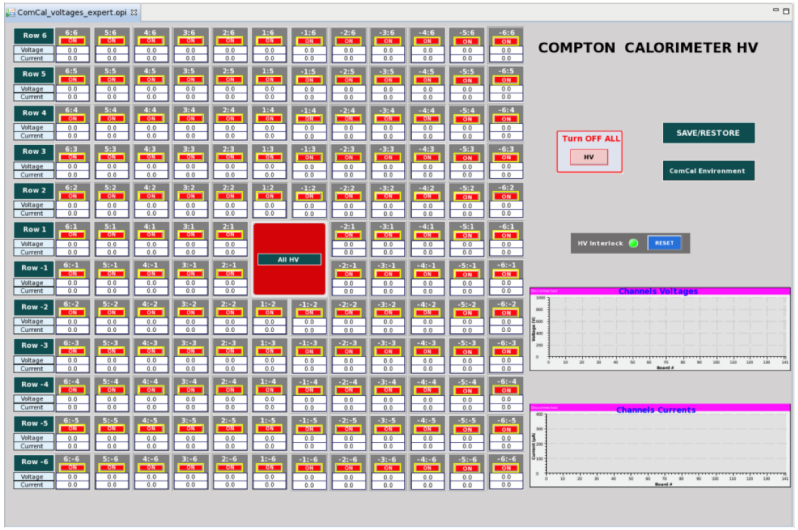
DAQ, Controls

DAQ is modernization and modification of standard Hall C DAQ. Hall AC Physics staff is responsible for DAQ.

DAQ needs some modest firmware changes of JLab modules. (FADC, VTP, …). Fast electronic group committed to support this.

DAQ and HV hardware is Hall C responsibility. Hall has been steadily making procurements to support NPS and as part of normal modernization.

Hall C is “owner” of controls, but will get help from detector support group (physics div), spectrometer support group (Hall AC) and build on controls used for DVCS/COMCAL.

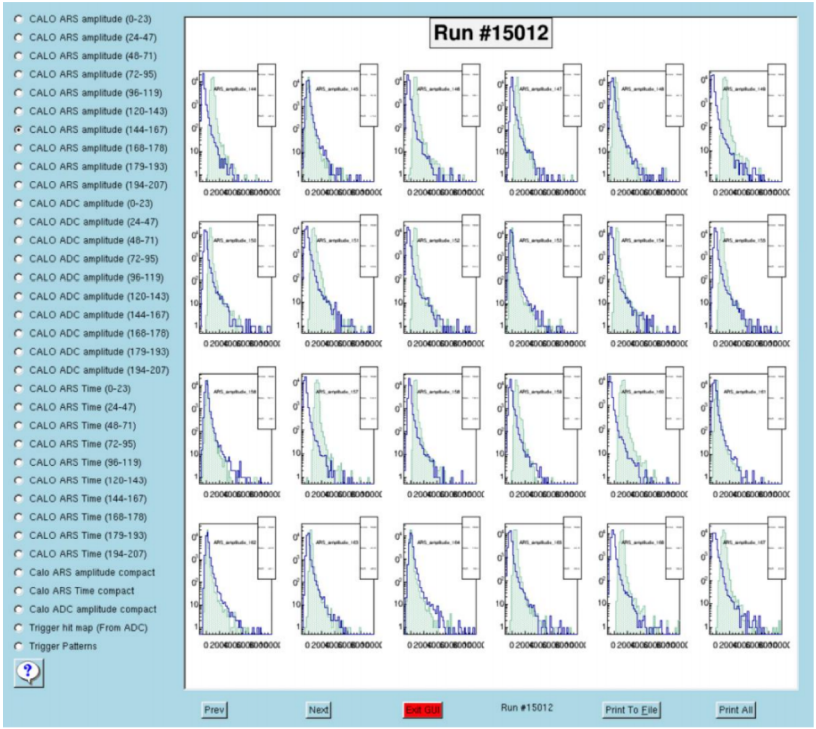


Software

Simulation software is well developed. Was used in development of detector design. Used in estimates of radiation damage to crystals.

Analysis software is “owned” by collaboration. Led by Ohio, input from Yerevan. Merging DVCS calorimeter into Hall C analyzer hcana. (hcana is built on Hall A software.)

Low level software (event unblocking, module decoding) is Hall AC physics staff responsibility. May request help from DAQ group.



Radiation Estimates – E12-13-007/E12-13-010

Hall: C **RADIATION BUDGET FORM** *page:* 1 of 1

Exp. # Run group **rev:** **run dates: 2020** **name of liaison: S. Wood**

E12-13-007, E12-13-010

setup number			1	2	3	4	5	6	7	8	9	10	11	
beam	energy	GeV	11.00	11.00	11.00	6.60	6.60	8.80	8.80	8.80	11.00	6.60	8.80	*totals:*
	current	uA(CW)	28.0	50.0	11.0	28.0	11.0	28.0	5.0	50.0	40.0	40.0	40.0	
exp't target	element		H	H	H	H	H	H	H	H	Al	Al	Al	
	thickness	mg/cm2	710	710	710	710	710	710	710	710	536	536	536	
	dist. to pivot	m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Z		1	1	1	1	1	1	1	1	13	13	13	
	A		1	1	1	1	1	1	1	1	27	27	27	
cryo tgt window	element		Al	Al	Al	Al	Al	Al	Al	Al				
	thickness	mg/cm2	137	137	137	137	137	137	137	137				
	dist. to pivot	m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	Z		13	13	13	13	13	13	13	13	0	0	0	
	A		27	27	27	27	27	27	27	27	0	0	0	
critical window	radius	cm	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	
	dist. to pivot	m	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	
scattering weighting factor			0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
time	run time (100% eff.)	hours	480	264	24	144	24	144	24	24	96	24	24	1272
		days	20.0	11.0	1.0	6.0	1.0	6.0	1.0	1.0	4.0	1.0	1.0	53.0
	installation time	hours												0
		days	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dose rate at the fence post (run time)	method 1	urem/hr	0.57	1.02	0.23	0.72	0.28	0.63	0.11	1.13	1.53	1.63	1.57	
	method 2	urem/hr												
	conservative	urem/hr	0.57	1.02	0.23	0.72	0.28	0.63	0.11	1.13	1.53	1.63	1.57	
dose per setup		urem	275	270	5	104	7	91	3	27	147	39	38	1005.5
% of annual dose budget		%	2.8	2.7	0.1	1.0	0.1	0.9	0.0	0.3	1.5	0.4	0.4	10.055
% of allowed dose for the total time														69.25
% of allowed dose for the run time only														69.25

If > 200%, discuss result with Physics Research EH&S officer

date form issued: April 3, 2019 *authors:* P. Degtiarenko

Radiation Estimates – E12-14-003/E12-14-005

Hall: C **RADIATION BUDGET FORM** *page:* 1 of 1

Exp. # E12-14-003 **rev:** **run dates: 2020** **name of liaison: B. Wojtsekhowski**

setup number			1	2	3	4	5	6	7	8	9	10	11	12	
beam	energy	GeV	8.80	8.80	8.80	8.80	8.80	8.80	11.00	11.00	11.00	11.00	11.00	11.00	*totals:*
	current	uA(CW)	5.0	15.0	45.0	45.0	60.0	60.0	20.0	20.0	30.0	30.0	60.0	60.0	
radiator	element		Cu		Cu		Cu		Cu		Cu		Cu		
	thickness	mg/cm2	772		772		772		772		772		772		
	dist. to pivot	m	-1.00		-1.00		-1.00		-1.00		-1.00		-1.00		
	Z		29	0	29	0	29	0	29	0	29	0	29	0	
	A		64	0	64	0	64	0	64	0	64	0	64	0	
exp't target	element		H	H	H	H	H	H	H	H	H	H	H	H	
	thickness	mg/cm2	710	710	710	710	710	710	710	710	710	710	710	710	
	dist. to pivot	m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Z		1	1	1	1	1	1	1	1	1	1	1	1	
	A		1	1	1	1	1	1	1	1	1	1	1	1	
cryo tgt window	element		Al	Al	Al	Al	Al	Al	Al	Al	Al	Al	Al	Al	
	thickness	mg/cm2	80	80	80	80	80	80	80	80	80	80	80	80	
	dist. to pivot	m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Z		13	13	13	13	13	13	13	13	13	13	13	13	
	A		27	27	27	27	27	27	27	27	27	27	27	27	
critical window	radius	cm	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	3.175	
	dist. to pivot	m	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	
scattering weighting factor			0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
time	run time (100% eff.)	hours	20	5	20	5	80	10	15	5	20	5	180	15	380
		days	0.8	0.2	0.8	0.2	3.3	0.4	0.6	0.2	0.8	0.2	7.5	0.6	15.8
	installation time	hours													0
		days	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
dose rate at the fence post (run time)	method 1	urem/hr	0.54	0.16	4.90	0.47	6.53	0.62	2.15	0.20	3.22	0.30	6.45	0.60	
	method 2	urem/hr													
	conservative	urem/hr	0.54	0.16	4.90	0.47	6.53	0.62	2.15	0.20	3.22	0.30	6.45	0.60	
dose per setup		urem	11	1	98	2	522	6	32	1	64	1	1161	9	~~1909.4~~
% of annual dose budget		%	0.1	0.0	1.0	0.0	5.2	0.1	0.3	0.0	0.6	0.0	11.6	0.1	19.094
% of allowed dose for the total time															440.17
% of allowed dose for the run time only															440.17

If > 200%, discuss result with Physics Research EH&S officer

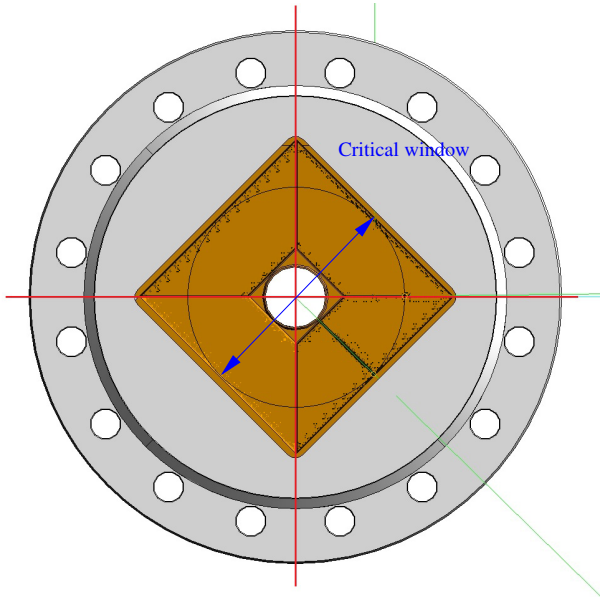
date form issued: April 26, 2019 *authors:* P. Degtiarenko

6% Radiator 100 cm upstream of target

Radiation – E12-14-003/E12-14-005

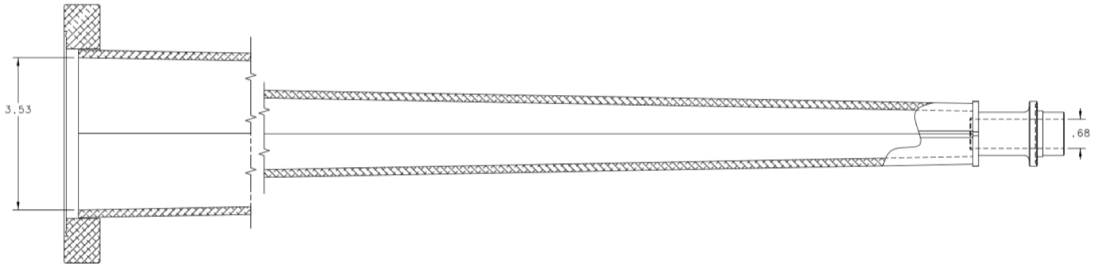
"Wide Angle" experiments use 6% radiator.

Pipe for sweeper region (trapezoidal) defined critical radius as larger pipe can be used downstream. Radiation estimates assume circle instead of diamond critical window.



Instantaneous site boundary backgrounds high, but less than recent J/Psi experiment in Hall C. J/Psi was 25% of annual dose budget over 11 PAC days. WACS (with radiator 1m in front) is 19% over 16 PAC days.

J/Psi experience: DAQ crashes (<~ 1/week)
Some SHMS control system crashes. Less of issue as SHMS magnets not used.



Other Radiation Issues

Activation preventing maintenance of detector?

Hall A DVCS experience is that detector maintenance could happen without a formal RWP. (Close coordination with RadCon sufficient.)

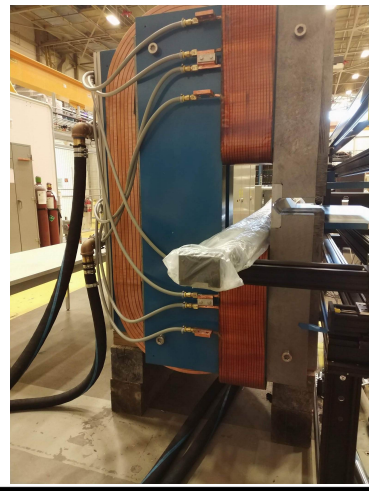
Radiation damage to sweeper water hoses?

Hoses for compensation coil are close to target. Will evaluate if metal hoses should be used.

(SOS hoses did suffer damage, but lifetime was years.)

Radiation damage to detector crystals.

Crystals can be cured in place with LED curing system.



Standard Documentation

Conduct of Operations (COO)

- No change to text
- Update experiment numbers
- Update contact info and liaison

Experimental Safety Assessment Document (ESAD)

- No changes

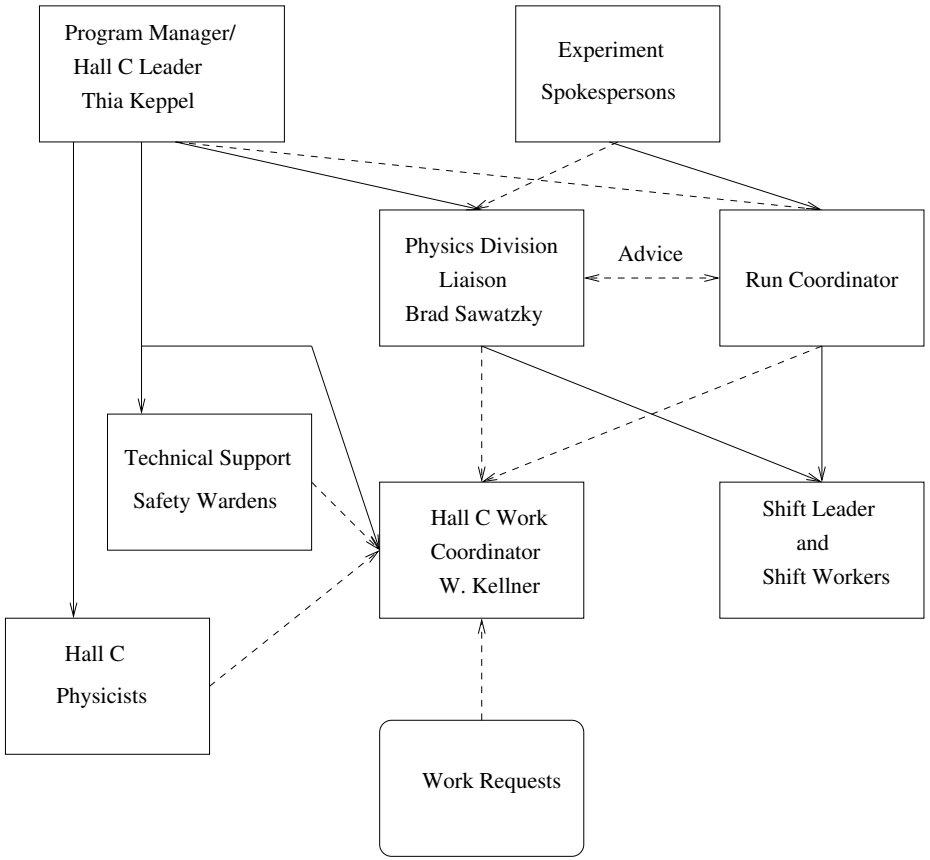
Emergency Response Guidelines

- Update Hall layout diagram
- (Show NPS platform extension)

Standard Equipment Manual

- Include radiator description
- (currently an OSP)

(See links to current versions of these documents in Wiki.)



OSPs – Previous Examples

Physics Division requires new equipment documented through Operational Safety Procedures. (Independent of risk factor.) These OSPs allow for Subject Matter Expert review of new equipment.

Radiator – ENP-16-81840-OSP

Pivot Area access – ENP-16-61900-OSP

Drift Chamber Gas and Mixing System – ENP-16-47415-OSP

HMS Drift Chambers – ENP-16-71689-OSP

Hall C Fast Raster - ENP-16-59937-OSP

New OSPs

Sweeper magnet testing and mapping

TOSP Under development for Test Lab magnet testing.

Testing and User operation of sweeper magnet in Hall

Authorizes full current testing and routine use by shift crews.

NPS Platform access

Document procedures and limitations to access of detector and magnet.
May need to amend or merge with existing Pivot access OSP

NPS detector

Covers User operation
Document which tasks (e.g. repair/maintenance) are expert only
List experts

Checklists

Existing checklists:

- Detectors – Use for just HMS
- Upstream Beamline – OK
- Technician – OK
- HMS Magnet – OK
- SHMS Magnet – Modify. Insure power supplies off, cryo in standby
- Spectrometer Rotation – OK
- Target – OK

New checklists:

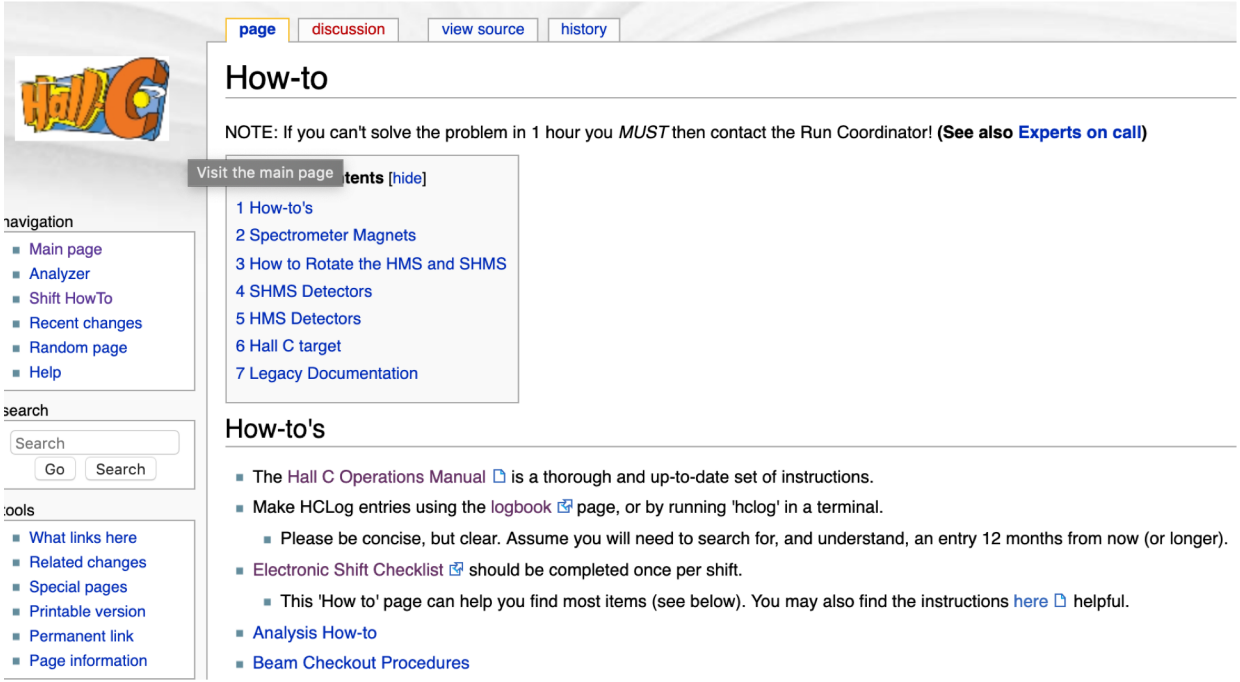
- Sweeper magnet - PS, LCW OK, sinage, controls, area clear, …
- NPS detector – HV, DAQ crates, cooling, controls

Howtos

Extensive set of “Howtos” developed in Wiki for use by shift crews.

Reuse HMS, Controls and DAQ howtos

Add Howtos for NPS operation and experiment specific procedures.



https://hallcweb.jlab.org/wiki/index.php/How-to

END