

Overview of 2016 ERR Recommendations

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Summary

Status and Completion	Show plans to completion
^{48}Ca Target	Oxidation protection
^{208}Pb Target	Target melting
Septum	LCW Estimate
Septum Fringe	Q1 effects and spot on dump
EHS&Q	Include EHS&Q considerations
Beam	Study parity quality
Radiation	Site boundary
Responsibilities	Continue working with Hall A

Item 1: Status and Completion

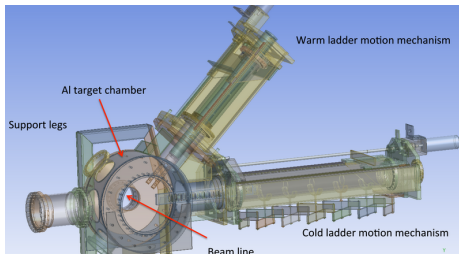
Recommendation

- The next ERR would seem to be the appropriate time for a detailed schedule and final task list. Completion plans and commissioning must be covered at the next review.
- The collaboration has continued to make significant progress on the targets, target chamber, septum, beamline, and radiation calculations to ensure readiness.
- Details on remaining tasks for each system will be presented in the corresponding talks.

Item 2: ^{48}Ca Target

Recommendation

- In the event of long term vacuum loss, or if the scattering chamber needs to be brought up to atmospheric pressure, we recommend that the ^{48}Ca target be protected with inert gas. The collaboration also needs to think about how to remove and store the ^{48}Ca target at the end of the experiment.
- An inert gas system has been included in the design of the target chamber.
- Note: $<10\%$ oxidation of the target does not present systematic experimental issues for CREX.
- To be presented by Silviu Covrig Dusa - Target Chamber

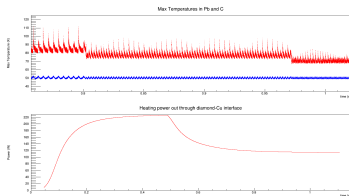


Item 3: ^{208}Pb Target

Recommendation

- It is desirable to consider and develop an engineered solution to capture melted lead.
 - There remains a general lack of understanding of the failure modes of the target. Because the thermal conductivity of diamond is negligible near 4K, a steady-state analysis could conceivably miss the possibility of damage/melting from a too-rapid beam ramp. At the next ERR, the results of a time-dependent analysis from 4K to equilibrium temperature should be presented assuming instant turn-on of the beam.
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- There has been no observed flow of melted lead from previous running.
 - Time-dependent thermal calculations if instantaneous beam with raster have been performed on the ^{208}Pb target
 - To be presented by Silviu Covrig Dusa - Target Chamber

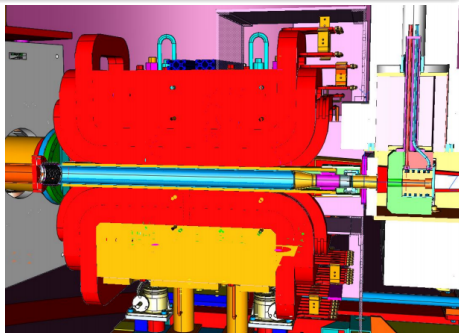
At 70 μA : transitions from $\Delta f = 120$ Hz, to $\Delta f = 240$ Hz, to $\Delta f = 480$ Hz, where $\Delta f = f_x - f_y$ is the difference between raster x and raster y frequencies



Item 4: Cooling for Experiment

Recommendation

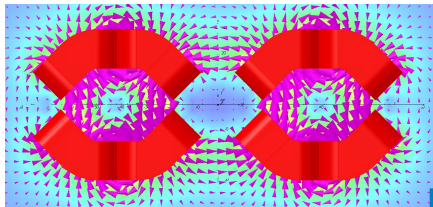
- A detailed LCW estimate should be presented for the entire experiment
- An LCW estimate for the entire experiment has been performed and the requirement is within the ultimate capabilities of the hall.
- To be presented by Robin Wines - Hall A Configuration and Design Status



Item 5: Beamline Fringe Fields

Recommendation

- Include the effect of the HRS Q1 fringe fields on potential beam deflection, then
 - Check with Keith Welch that the magnified beam spot is safe for beam dump operation, or develop mitigation procedures.
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- More detailed studies of the fields on the beamline with the quads has been performed
 - To be presented by Juliette Mammei - Septum Magnet and Quads



Recommendation

- The next ERR should give particular attention to whether EHS&Q considerations have been properly included in the near final design of the equipment.
- EHS&Q considerations have been made as the designs are finalized and will be presented in the corresponding discussions.
- e.g.
 - Continued to improve and add to safety documents
 - Design of magnet and collimation have had deinstallation in mind
 - Design authorities responsible to the lab have been supervising the designs

Item 7: Beam Quality

Recommendation

- The Parity Quality Beam team should continue to establish robust parity beam diagnostics in the Hall-A line. Aggressively request the use of beam studies time during beam operations.
- Prepare to study parity beam quality with CEBAF at near 2 GeV/pass during Fall 2016 and Spring 2017 beam operations.
- Beam studies have been ongoing in the collaboration
- We have been active in taking opportunistic data in a variety of configurations

Item 7: Beam Quality

Parasitic Beam Data

2015-2017: >500 runs, >150 hours of data

In Hall A:

energies (2.2,4.4,6.4,8.5,9.9,10.2 GeV)

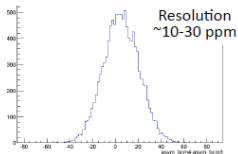
currents (5,10,15,20,45,65,70,75 uA),

targets (LH2, carbon graphite, BeO, Al targets)

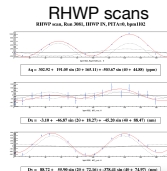
- Qualifying instrumentation (analog and digital BCMs, BPMs, cavity bpm's, SAMs)
- Studying beam correlations, noise, precision

Injector beam studies: beam asymmetries, laser properties, instrumentation, practicing source configuration

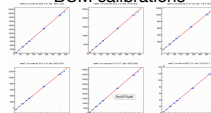
Study Monitor Resolution "double-difference" width



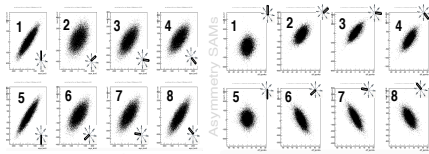
Analog BCM double difference 30Hz, 20uA



BCM calibrations



Study Cross-Correlations



SAM Aq, BCM Aq, bpm 4e position differences

Beam

Recent test runs to check beam quality, monitor performance

BCM resolution exceeds PREX requirements

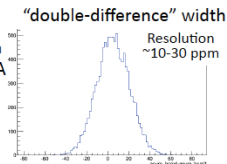
PREX-II statistical width ~ 120 ppm @ 30Hz

BCM resolution of 40ppm would be 5% loss of resolution

1 MHz BCM electronics: ~ 25 ppm resolution @ 30 Hz, 20uA

Confirmed by excess noise with small-angle detectors

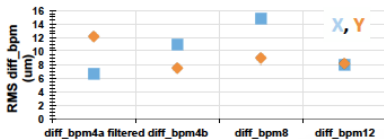
Similar to width measured in PREX-I



Charge and position jitter looks similar to 6 GeV era

A_Q: 100-300 ppm RMS. Δx : 5-25 μ m RMS. (20 μ A, 30 Hz, 2.2 GeV)

1 pass beam



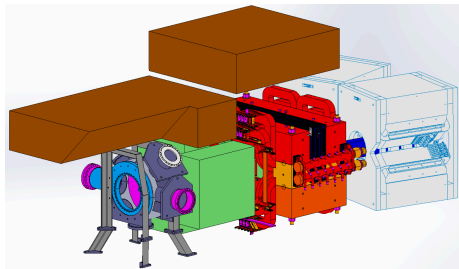
(Other energies look similar, too)

Item 8: Radiation

Recommendation

- Based on the conceptual shielding design, the site boundary dose is approaching the limit *even assuming no Hall C operation* (primarily due to CREX running). To increase the confidence that the site boundary dose in a given calendar year will not be exceeded, and simplify multi-Hall scheduling, the collaboration should implement their idea of installing additional shielding over the ^{48}Ca target to reduce sky-shine.
- Another iteration of the radiation calculations will be needed when the engineering design of the targets and the interaction region is finalized.

- Radiation studies have converged on sky shine shielding to control site boundary limits.
- To be presented by Kent Paschke - Radiation



Recommendation

- The experimenters should work with Hall A management to better quantify their design and engineering needs.
- The collaboration has continued to work with Hall A and has produced a design document detailing these issues and needs.

<http://hallaweb.jlab.org/parity/prex/PrexCrexDesign.pdf>

Charge Item 10

- Are the responsibilities for carrying out each job identified, and are the manpower and other resources necessary to complete them on time in place?
- Has the equipment ownership, maintenance and control been defined during beam operations?

System	JLab Staff Responsible	Collaboration Responsible
Target	Target Group	Silviu Covrig Dusa
Septum Magnet	Jack Segal	Juliette Mammei
Radiation Collimator	Robin Wines	Kent Paschke
Radiation Shielding	Robin Wines	Kent Paschke
Detectors	Jack Segal	Dustin McNulty
Data Acquisition	Robert Michaels	Raktiha Beminiwattha
Moller Polarimeter	Javier Gomez	Glamazdin, Napolitano
Compton Polarimeter	Dave Gaskell	Gregg Franklin
Data Analysis	Robert Michaels	Paschke, Riordan
Beamline	Doug Higinbotham	Krishna Kumar

- Will be presented by Bob Michaels.

Charge Item 11

- Are the specific documentation and procedures to operate safely and efficiently the equipment, in place and adequate? This includes demonstrated readiness for full rate capability and expedient analysis of the data.
 - The collaboration is clearly aware of the EHS documentation expectations. However, not all specific documentation and procedures are in place and adequate. Place-holders exist which is appropriate for this stage. Responsibilities need to be assigned. Time is more than adequate to bring these to completion.
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- The collaboration has continued to work on EHS&Q documentation
 - Dave Gaskell will be physics liaison
 - Will be presented by Bob Michaels.