Report of the

EIC Central Detector Solenoid Magnet Power Supply

Final Design Review

Performed at Jefferson Lab (Hybrid)
Newport News, Virginia

May 28, 2024

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1. Executive Summary

JLab's presentation and the power supply document demonstrated a good understanding of the requirement for the superconducting magnet power supply. The power supply specifications are well developed and documented in document PMAG0000-0300-S0004, Rev-0. The requirement for the quench detection and protection is well understood. However, the detailed specifications still need to be developed prior to the procurement. The detailed FAT and SAT document also need to be developed for the procurement package.

2. Reponses to Charge Questions

Responses to Questions

Charge Question 1:

Are the technical performance requirements and subsystem interfaces complete, documented, and understood?

Yes, but please go to recommendations.

Comments

- 12-pulse SCR based design is preferred then should be clearly noted in the specification document with a passive filter
- Fix the ramp rate typo, should be 1A/sec
- Ground Isolation should be 5Mohms or greater
- This should be stated: Dump switches should be mechanical switches
- The magnet itself should be designed to handle 1.5KV
- Also add ZVT to measure zero voltage across the capacitor (something similar to the Panduit unit at the 480Vac mains)
- Reexamine the water pressure numbers (300psi is too high, also test pressure of 450psi is too high as well)
- Get MTBF number from the vendor and how did they calculate it
- Power supply vendor should show how they mitigate stored energy in the filter chokes when the dump switch opens
- QD should be done by JLab or BNL group

Recommendations

- A system diagram should show redundant dump switches (not stated in the documentation)
- Power supply should be able to be hi-potted to 1.5KV
- Remove PARD from the specification document
- Make sure the dump switches are rated to open without generating large transients
- Limit the dump voltage to 1.3KV
- NMR field stabilization should be taken out of the specification but should be part of the

SAT. Put in the specification document mention that the supply will be tested using the NMR probes for 24 hours

- Add ethernet communication to the specification requirement
- More detailed dump resistor specification should be added

Charge Question 2:

Are the plans for achieving magnet power supply performance and construction sufficiently developed and documented for the present phase of the project, (i.e., are they commensurate with the planned initiation of the procurement)?

Yes.

Comments

- The plan is very detailed but missing a few items as mentioned in recommendations for question 1 (see above).

Recommendations

- None

Charge Question 3:

Do the magnet power supply design and specifications meet the performance requirements with a low risk of cost increases, schedule delays, and technical problems?

Specifications are achievable and risk of cost increase is low.

Comments

- None

Recommendations

- None

Charge Question 4:

Are the fabrication and assembly plans for the magnet power supply consistent with the overall project and detector schedule and sufficiently developed to initiate the procurement?

Yes, but project should come up with a plan for long term storage (in case vendor delivers PS more than a year ahead of system integration).

Comments

- None

Recommendations

- None

Charge Question 5:

Are the plans for integration in the overall BNL infrastructure appropriately developed to initiate the magnet power supply procurement?

Not sure, not enough time to dive into those plans.

Comments

- None

Recommendations

- None

Charge Question 6:

Have previous review recommendations been adequately addressed to initiate the procurement?

No previous technical design review.

Comments

- None

Recommendations

- None

Charge Question 7:

Have ES&H and QA considerations been adequately incorporated into the magnet power supply design and procurement planning?

Yes.

Comments

- Presentation provided detailed PS design and construction with safety considerations
- The QA plan was not provided

Recommendations

- None

Charge Question 8:

Is the procurement approach sound and the procurement schedule credible?

Yes, but this is such a long procurement which means it would need more oversight on the vendor for execution of the project.

Comments

- None

Recommendations

- None

3. Conclusion

The requirement for the power supply and the magnet quench protection is well understood. The design is at the required level for the final design. It will be ready for the procurement after finalizing the specifications and the Statement of Work and as well the FAT and SAT document.

4. Appendices

4.1 Appendix A: Charge to the Review Committee

Jefferson Lab
Thomas Jefferson National Accelerator Facility

MEMO

Date: 16 May 2024

To: Howie Pfeffer (FNAL), Ju Wang (ANL)-Chair, Onish Kumar (JLab)

From: Rolf Ent (JLab) and Elke Aschenauer (BNL)

Subject: Charge for the Solenoid Magnet Power Supply Final Design Review

The main purpose of the Solenoid Magnet Power Supply Final Design Review is to assess the magnet power supply construction readiness. The scope of this review includes the final design of magnet power supply for the EIC detector superconducting solenoid procurement strategy. During the Final Design Review of the detector solenoid, it was recommended to include possible long lead procurement that support the timely commissioning of the detector magnet in potential CD-3B review; the magnet power supply is one of these items. The scope of this review also includes the procurement strategy for the magnet power supply.

Charge questions:

1. Are the technical performance requirements and subsystem interfaces complete, documented, and understood?
2. Are the plans for achieving magnet power supply performance and construction sufficiently developed and documented for the present phase of the project, i.e., are they commensurate with the planned initiation of the procurement?
3. Do the magnet power supply design and specifications meet the performance requirements with a low risk of cost increases, schedule delays, and technical problems?
4. Are the fabrication and assembly plans for the magnet power supply consistent with the overall project and detector schedule and sufficiently developed to initiate the procurement?
5. Are the plans for integration in the overall BNL infrastructure appropriately developed to initiate the magnet power supply procurement?
6. Have previous review recommendations been adequately addressed to initiate the procurement?
7. Have ES&H and QA considerations been adequately incorporated in the magnet power supply design and procurement planning?
8. Is the procurement approach sound and the procurement schedule credible?

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4.2 Appendix B: Review Committee

Reviewer Name	Affiliation	Email Address
Ju Wang - Chair	ANL	juw@anl.gov
Howie Pfeffer	FNAL	pfeffer@fnal.gov
Onish Kumar	JLab	okumar@jlab.org

4.3 Appendix E: Agenda

EIC Central Detector Solenoid Magnet Power Supply Final Design Review

Tuesday, May 28, 2024

Conference Room F324-325 (CEBAF Center, 3rd Floor) and Zoom

Click here for Zoom link (Open Session)

Time	Talk Topic	Speaker
8:30 AM – 9:00 AM	Executive Session	Closed Sessions
9:00 AM – 9:20 AM	Welcome and Project Status	Rolf Ent (JLab) / Elke Aschenauer (BNL)
9:30 AM – 9:50 AM	Detector Solenoid Overview and Current Status	Renuka Rajput-Ghoshal (JLab)
10:00 AM – 10:45 AM	Magnet Power Supply	Probir Ghoshal (JLab)
11:00 AM – 11:30 AM	Discussions and further questions	All
11:30 AM – 12:30 PM	Lunch	All
12:30 PM – 2:30 PM	Executive session	Closed Session
2:30 PM – 3:00 PM	Closeout	All