

**GlueX DIRC and Phase II running ERR.**

**Have the EHS&Q considerations been properly included in the design of the DIRC detector?**

Finding 1. Yes, EHS&Q considerations were found to be included in the design of the DIRC through the use of pressure system and structural documents that were presented and made available to reviewers.

**Has the detector been completed, commissioned and ready to operate? If not, what are the completion/commissioning schedule and tasks?**

Finding 1.

No. The DIRC Detector has not been completed. However, it is believed that as long as the delivery schedule for the Optical box is maintained the detector will meet the presented schedule for commissioning in the fall of 2018 and be fully operational by the fall of 2019.

Recommendation 1.

The schedule for DIRC installation and testing before the hall closes for GlueX operation is extremely tight. The installation plan should be carefully evaluated to ensure that it can be safely completed in the allowed time. An alternative plan for commissioning and testing should be developed in case installation and commissioning are not completed on time.

Recommendation 2.

List all of the goals and milestones for successful commissioning.

Recommendation 3.

The magnetic field on the PMTs and magnetic shielding were concerns raised in the 2015 review (Technical comments 23 and 24). The results were not presented to this review. The committee recommends that those comments on the previous review should be addressed.

**Have all the tasks needed to safely mount AND OPERATE the detector been identified and defined adequately?**

Finding 1.

No. The first 2 detector bars are already installed. Detailed schedules, procedures and documentation need to be presented for the remainder of the detector system.

Finding 2.

No. The committee has concerns that the cooling for the electronics in the dark box may not be adequate to operate the detector. This is a concern for both safe and reliable operation.

Recommendation 1.

Provide an evaluation of the cooling requirements and confirm that the cooling will be adequate. If the cooling is not adequate produce an updated schedule that reflects the steps needed to provide a system that can be reliably and safely operated.

Recommendation 2.

Water quality requirements and monitoring are necessary, should be carefully studied and a procedure documented.

Recommendation 3.

The procedure for integration of the DIRC into the GlueX DAQ has not been presented. A detailed plan for integrating the detector into the DAQ system should be developed. Similarly the integration of the DIRC into the slow control system was not thoroughly documented.

Recommendation 4.

Provide the projected background rate during high luminosity running and show the signal can be separated from the background.

**Has the detector ownership, maintenance and control during beam operations been defined?**

Finding 1.

Partial. Some operations manuals are available and it was presented that user training and procedure documents are in process.

Recommendation 1.

Complete maintenance and operational Documentation

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

Finding 1.

Partial. Resource laden schedules were presented and made available that indicate that each job has been identified and the resources are available for completion on time with the exception of the Optical Box.

Finding 2. Maintenance and training plans not complete.

Recommendation 1.

The optical Box delivery is the critical path for this installation. A contingency plan for late delivery needs to be available as well as an independent verification of the status of the Optical Box.

Recommendation 2.

Complete maintenance plans and training plans

Recommendation 3.

Clarify which manpower is provided by non-JLab and JLab groups. Verify that the manpower and other resources will be available if the installation and/or commissioning schedule is changed.

**Are the specific documentation and procedures to operate safely and efficiently the detector, in place and adequate? This includes initial operation.**

Finding 1.

Partial. It was presented that user training and procedure documents are in process.

Recommendation 1.

Complete maintenance and operational Documentation including completion of OSP

**Is trigger and DAQ configuration able to handle the event data rate expected for the high luminosity ( $5 \times 10^7$  photons/sec) running of the GLUEX detector in the Fall of 2019? Are the computing resources adequate?**

The trigger rate for high luminosity has been studied and it was stated that there was small deviation from a linear extrapolation. The DAQ configuration and the event size has been studied as well. Currently, handling the data rate is on two paths—1) to be able a write a sustained 1.5 GB/s, which has not been achieved. Significant degradation was observed in live time writing at relatively modest 0.925GB/s. 2) to use data compression which is the responsibility of the DAQ group.

Comment: While these two paths are correctly listed as remaining issues, no concrete plans were presented to establish the final configuration.

The computing resources are likely adequate. GlueX has developed a procedure for making projections for computing resources that are tuned based on a through understanding of the 2017 usage. They have developed a plan that uses computing resources at Jefferson Lab, at NERSC for reconstruction, and on the Open Science Grid for Monte Carlo production. A data challenge is planned for August for the NERSC reconstruction. The data challenge in August is likely to expose some limitations with the WAN connection to ESnet, currently 10Gb/s. Recently, significant MC events have been generated in a relatively short time on OSG. Still, the current estimates for MC projection are a first cut and have to be refined. The MC is a driver for the requested resources beyond those that are currently planned for.

Comment: GlueX has demonstrated that it is credible to perform large scale MC offsite on the OSG. This opens up other options for distributed computing—including cloud computing.

Comment: ESnet will upgrade the network connectivity to 100 Gb/s in 2020. Stress testing the Jefferson Lab WAN in FY19 is a positive development.

It has been recently discovered that the TOF rates are operating near their limit. The signal amplitudes drive current in PMTs. The upstream plane most affected.

Comment: It is certainly within the spirit of ERRs to present important emerging information. The committee understands that the collaboration has started to understand this issue and appreciates that it was raised during the review. The committee suggests decoupling addressing the TOF solution from tests of the DIRC

Recommendation 1: Add the plot that shows the dependence of trigger rate vs. luminosity to the documentation for this review.

Recommendation 2: Five outstanding issues were listed. Please provide target dates for completion of

- Demonstrate 1.5GB/s sustained DAQ rate for full system to disk
- Demonstrate compression of data stream prior to writing to disk
- Reevaluate MC requirements to better estimate Computing requirement
- Perform Data Challenge for offsite reconstruction at NERSC

Recommendation 3: Develop a plan for mitigating the the recently observed issues with the high rate TOF counters.

**Are the computing and manpower resources adequate for an expedient analysis towards timely publication?**

The first targeted analyses are Excited hyperons :  $\Xi^-(1820)$  and Excited strangonium ( ) :  $\phi(1680)$ ,  $\phi_3(1850)$ .

It seems likely based on the past experience that that computing and manpower resources will be adequate. The current plan is for 14 months from data collection to publication, compared to the 18 months for the first beam asymmetry publication. There are process improvements that could shorten the time by 4 or more months. These include fast turn around calibrations, established procedures for producing MC events and for producing samples for analysis.

Comment: The only information presented concerned the detectors and computing, and it is credible to see process improvements there. At the same time, a comparable level of preparation for the physics was not presented.

Recommendation: Develop a physics motivated plan for publication in 14 months after data collection.





