Report

Readiness Review for pass1 processing of the HallB/CLAS12 RG-B Spring 2019 data set

Friday, May 10, 2020

Review committee:
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The review to assess the readiness of RG-B to process Spring 2019 data set took place on May 8, 2020, remotely over bluejeans. For the agenda and presentations please refer to the review page:
https://clasweb.jlab.org/wiki/index.php/Run_Group_B#tab=Pass-1_review

The goal of this large scale data processing is to provide enough statistics for the first publication(s) of physics results from CLAS12 in FY20, nDVCS in particular. Note that this is not the final processing of this data set (as was also the case with RG-A pass1 data processing). Certain aspects of the software, alignment, and calibrations are not yet final, e.g. CVT alignment and the tracking algorithm for the central tracker, and final processing will be done after everything is ready.

The review committee thanks the RG-B team for preparing the presentations, providing ancillary information, and for patiently answering our questions during the review meeting. Below are our answers to the Review Charge questions, and some comments and recommendations. RG-B has done a great job with calibrations and understanding the data set. However, there are certain aspects of the calibration and validation of the expected new Coatjava release that has to be completed before the Pass1 data processing can start.

Review Charge:

Charge #1: *Is the quality of detector calibration and alignment adequate to achieve the performance specifications foreseen for CLAS12 or achievable at the current time, given the "state of the art" calibration, alignment and reconstruction algorithms?*

No – While the current algorithms and methods used for calibration, alignment, and the reconstruction of data are adequate to achieve the CLAS12 performance specifications as has been demonstrated for RG-A and in most part for RG-B, the quality of RG-B calibrations of a few detector components, and some run ranges,

must be improved before the start of the pass1. Moreover, the software release that will be used for RG-B pass1 is not the one used to obtain the results presented at the review.

Comments:

For the most part detector component calibrations are in reasonable shape. But recalibration of FTOF for a few runs, DC for RG-B, and FTcal at the beginning of the run period can improve the quality of data.

Recommendation:

1. The identification of neutrons in CND and ECal and accurate reconstruction of its kinematics is important for key physics of RG-B experiments. As was shown, there is a significant shift in reconstructed beta for photons in both detectors, which ultimately will affect the quality of PID and momentum reconstruction of neutrons. Before pass 1 this issue must be resolved.
2. Another important parameter for RG-B is the reliable identification of deuterons. As it has been shown, neutrons can be identified using time-of-flight in FD, but the beta vs. momentum distribution in CD does not show any hint of deuterons. A critical parameter for deuteron ID is the energy loss in the scintillator counters (CTOF and CND). Proper dE/dX information from these detectors must be presented in REC::XXX banks for users.
3. Since a new software release will be used for pass1, another pass0 with the new software must be performed, with full QA of high-level physics quantities.

Charge #2: *(a) Is data quality as a function of run number or time for the data set that is proposed for pass1 cooking stable and understood? (b) Is reconstruction efficiency consistent with expectations and reproducible by appropriate MC simulations?*

(a) Yes – timelines for most of the parameters have been shown and discussed. Most of the monitored parameters are within expected tolerances. Some outliers will be corrected before pass1 (e.g. FTOF one sector at the end of the run, FTcal and FTHodo, …)

(b) No – but, there is an ongoing work in the collaboration to understand the reconstruction efficiencies, develop and validate beam background merging software for the data and MC. It is expected to have everything ready in about a month.

Comments:

Timelines showed a drift of up to ~100 μm for the mean of some DC residuals. In addition there is a systematic spread of ~150 μm between R1 and R3 residuals, and a sudden offset for run 6546. Similar artifacts were seen in RG-A data where studies of the missing mass distribution of eπ+, showed insignificant change in the means and slightly worse resolution due to an order of 100 μm change of residuals. Our understanding is that DCs have not been calibrated for RG-B, instead, constants from the calibration of RG-A later runs (spring 2019) have been used. Considering that there is still a couple of weeks of work to be fully ready for pass1 (may even have to wait for RG-A to finish) we suggest considering to calibrate DC for at least one of the RG-B runs to improve the residuals. We also suggest running a similar analysis done by RG-A to assess the effect of drifts and the spread of DC residuals on kinematics reconstructed tracks.

Recommendation:

None.

Charge #3: *(a) Are analysis plans for the data set developed at adequate levels? (b) Is the list of planned skims defined and tested running analysis trains on preliminary data? (c) Are preliminary analysis results for the main reaction channels and observable available and consistent with expectations? (d) Is all ancillary information (helicity, Faraday Cup, …) available and understood?*

(a) Yes – The analysis plans for the leading candidates for the first publication of RG-B, nDVCS for example, are developed enough to proceed with analysis of a large data set.
(b) Yes – The skim list is in place. Four skims are defined that will compose ~20% of full DST output.
(c) Yes – The preliminary analysis results for many physics reactions are encouraging.
(d) No – Beam spin asymmetries have been shown, but not beam charge normalized yields, which are still in progress.

Comments:

Full QA for high level physics quantities (yields of different final states, beam spin asymmetries …) should be demonstrated, see below.

Recommendations:

None.

Charge #4: *Are data processing tools that will be used adequate for the proposed processing task? Is the data management plan (staging area, tape destination, directory structure, logs, …) defined and appropriate given the available resources? Is the estimate of resources needed to complete the task sound?*

Yes – Data processing tools, the data management plan, and the required resources are adequate for processing of this data set.

Comment:

It will take about 3 months to complete the pass1 processing. About 14 TB of disk space will be needed to store skimmed files for physics analysis.

Recommendations:

None.

Charge #5: *What are the plans for monitoring the quality of the cooking output and identify/correct failures?*

Monitoring tools used by RG-A will be deployed to perform QA of the processed data. It has been tested for few runs but more runs must be included to verify the quality of processed data.

Comment:

The monitoring of normalized yields and beam spin asymmetries have been shown (web portal of the monDB) only for four runs.

Recommendations:

After a new software release and pass0 cooking, monitoring of all (most) runs must be performed and stored in DB.

Charge #6: *Is the manpower adequate for the proposed data processing?*

Yes – The available manpower is adequate for completing the calibration and processing of the RG-B spring 2019 data set.

Recommendations:

None.