

**From:** Run Group K - Color Confinement and Strong QCD

**To:** CLAS Coordinating Committee

**Object:** Request for Pass-1 Data Processing

Run Group K has undergone a pass-1 Readiness Review, which assessed that the group is ready for pass-1 processing of their data. All documentation is available at the webpage: [https://clasweb.jlab.org/wiki/index.php/Run\\_Group\\_K-tab=Pass1\\_Review\\_Documents](https://clasweb.jlab.org/wiki/index.php/Run_Group_K-tab=Pass1_Review_Documents)

We are now formally requesting to **start pass-1 data cooking for RG-K in parallel with the ongoing RG-B data processing.**

As stated during the RG-K pass-1 review, the expected processing time is 25 days at 100% efficiency, considering the Hall B production fair share as shown in the following table.

| Full RG-K Data Processing        |                         |
|----------------------------------|-------------------------|
| Data set                         | RG-K                    |
| Beam energy                      | 7.546 GeV and 6.546 GeV |
| Target                           | Liquid H <sub>2</sub>   |
| Torus field                      | +100% (neg. outbending) |
| Run range                        | 5674-6000               |
| Total events count               | 17 G                    |
| Processing speed                 | 770 M events/day        |
| Processing time, 100% efficiency | <b>25 days</b>          |
| Daily output, DSTs               | 1.6 TB                  |
| Daily output, trains             | 1.3 TB                  |
| Total data size, DSTs            | 40 TB                   |
| Total data size, train           | 1 TB                    |

The amount of available data and the quality of present calibration and data analysis support putting **two reactions on fast track** to get publication-quality results:

1. BSA from DVCS on a proton target at 6.5 GeV and 7.5 GeV
2. Beam-recoil  $\Lambda$  polarization from  $K^+\Lambda$  electroproduction on the proton.

### **BSA from DVCS on a Proton Target**

Extrapolating for a subset of processed data we expect a total of about 200k exclusive DVCS events with the proton detected in the FD, and an additional 1220k with the proton detected in the CD. These represent a factor 3 improvement in statistics over the originally published 6 GeV BSA data, **and clearly represents a publishable dataset.**

The analysis procedures for the events where the protons are detected in the CD will not consider protons momentum information from CVT, which is not necessary to reconstruct the exclusive reaction kinematics. Proton momentum may be determined from the CTOF information, and compared with the momentum transfer calculated between the virtual photon and the real photon. The same strategy was also used by the Hall A DVCS publications. Moreover the beam asymmetry observable is not sensitive to the possible variations of the detection efficiency of the proton in the central region, since it cancels out in the evaluation of the difference over the sum of events with opposite helicities.

### Beam-Recoil $\Lambda$ Polarization from $K^+\Lambda$ Electroproduction on the Proton

Based on the same sample of processed data and following the analysis procedure described at the webpage:

[https://clasweb.jlab.org/wiki/index.php/Run\\_Group\\_K\\_-\\_tab=KY\\_Analysis\\_Work](https://clasweb.jlab.org/wiki/index.php/Run_Group_K_-_tab=KY_Analysis_Work)

a total statistics of  $K^+\Lambda$  events, corresponding to  $\sim 3X$  more than the CLAS e1f dataset in the same  $Q^2$  range (1.4-3.8 GeV<sup>2</sup>), has been estimated. These data represent the dominant part of the available world data for these final states in the nucleon resonance region.

Moreover the relevant  $Q^2$  range for these outbending torus polarity data spans from 0.3 to 6.0 GeV<sup>2</sup> and the statistics from the available RG-K data in the low  $Q^2$  range from 0.3-1.4 GeV<sup>2</sup> is a factor of 13x the published data from CLAS, even just selecting the topology with the  $K^+$  in the FD.

The short-term plans are to focus on the extraction of the beam-recoil  $\Lambda$  polarization in the CLAS12 acceptance with the reaction products ( $K^+$  and p) in the FD, which corresponds to the dominant reaction topology. The analysis will be extended next to the topology with the  $K^+$  in the CD and the proton in the FD (the second most important topology) after implementation of the momentum correction from the PCORR task force. For the polarization analysis the proton angle measurement is critical and will still be provided by the accurate measurement in the FD.

Finally we believe that comparison of the RG-K results at 6.5 GeV with the published CLAS data is crucial for the **understanding of the detector response** and **validation of the results** at 7.5 GeV and 10.6 GeV beam energies, facilitating the road to CLAS12 first publications.

**Team:** strong team of faculty, staff, post-docs and students is in place to carry out the high level analysis, we have PhD students from KNU, MIT and MSU.

**Management:** we will continue our weekly meetings and additional meetings as needed to monitor the data quality and track the progress of the high level analysis towards the first publications from RGK.

Prof. Annalisa D'Angelo  
for the Run Group K

