

November 8, 2020

Report of the Review Committee regarding the follow-up response of the proponents of the Hall A E12-17-004 (GEn-RP) experiment dated October 15, 2020

Committee: Howard Fenker (Chair), Chris Cuevas, Pavel Degtiarenko, Bert Manzlak, Lubomir Pentchev

Committee since June 2020: Lubomir Pentchev(Chair), Chris Cuevas, Pavel Degtiarenko, Bert Manzlak, Drew Weisenberger

Observers: Ed Folts, Javier Gomez

In the last report, dated July 2020, the Review Committee recommended:

- Provide by October 15, 2020 an update on the detector status for both, UVa and INFN GEM chambers, that includes:
 - the number of layers assembled and the number of layers tested with cosmics.
 - characterization plots for the layers tested with cosmics in the same format as in the latest collaboration response.
 - the schedule for finishing the detector assembly and characterization that includes also time frame for modifications of the detectors (grounding, HV dividers) if needed, and the manpower involved in these activities.

- Provide the manufacturer/model# of the HV supply you plan to use along with a simple schematic of the HV connection method.

All the questions related to the HV connections have been answered. The HV divider limits the currents in the chamber to levels well below the class 2 electrical hazard limit.

The proponents of the experiment provided the requested information for the status of the UVa chambers, characterization plots for the tested layers and the schedule for finishing all the detectors that includes modifications of the frames and the HV dividers. It is not clear whether the problem with the elevated noise, discussed in their previous response and observed in the cosmic tests, has been mitigated with the frame modifications. Based on their efficiency plots we assume that the thresholds can be set low enough to achieve efficiency at a 90% level. Overall, despite of the tight schedule (as is the whole SAD schedule) and the pandemic, the production of the 11 UVa layers seems to be on track.

Due to the COVID restrictions in Italy, the modules for one of the two INFN layers are not ready. By the same reason, the testing of the detectors at JLab, normally done by the INFN team, was resumed only recently thanks to the help of the W&M group. The group didn't have time to familiarize with all details of the testing and they could not provide requested characterization plots. Due to the uncertainties related to the pandemic, it is very likely that the second INFN layer will not be manufactured, installed, and tested before the planned beginning of the experiment.

In their previous response the proponents claim that with one missing layer in front of the passive analyzer, the efficiency of the polarimeter will be reduced only by a few percent. The reason is that this block of chambers works only as a veto, not as a tracking device. If two INFN layers are not ready (less likely scenario), the chambers will be reshuffled and the statistical uncertainty of the physics result

when using one of the two polarimetry methods will increase by a factor of $\sqrt{2}$, while the other polarimeter will operate at full efficiency.

The Review Committee concludes that, mostly due to external reasons (the pandemic), the level at which the experiment will be ready is uncertain. At the same time even in the worst case scenario without the two INFN layers, the experiment will be able to achieve its physics goals using the charge-exchange polarimetry. This is an exploratory experiment to test this new polarimetry method in measuring the neutron form-factor ratio at a modest value (compared to the other SBS GEN experiment) of the momentum-transfer of 4.5 GeV^2 . The results of this method may have significant impact on the other SBS experiments that use recoil-nucleon polarimetry. The experience in operating such a large volume of GEM chambers in the GEN-RP experiment will certainly contribute to the success of the following SBS experiments that have their own significant physics impact.

The Committee has no further recommendations.