Charge for GEM Electronics Review

Overview

      The Super BigBite Spectrometer experiments consist of nucleon form factor measurements. Each experiment will use GEMs as part of the detector package but in different configurations. The experiment with the highest luminosity is the proton form factor experiment (Gep5). The layout of Gep5 is shown below with protons detected in the hadron calorimeter (HCAL) on beam left and electrons detected in the electron calorimeter (ECAL) on beam right. The front tracker is a set of GEMs after the SBS magnet and the rear tracker is two sets of GEMs to track the proton after scattering in the plastic (blue boxes) to measure the recoil polarization of the scattered proton.

      The front tracker will consist of 6 planes of GEMs being built by INFN groups at Rome, Catania, Genoa and Bari and is being coordinated Evaristo Cisbani at Rome. Along with the construction of the GEM modules, the Italians have developed an electronics system for GEM readout. The readout has a APV25 front end card which are readout by a VME Multi Purpose Digitizer (MPD) board. This MPD readout system is mature and an early version was used in the OLYMPUS experiment at DESY. This system will be used for the front tracker. Production of the front end cards is proceeding.

The rear tracker will consist of a total of 10 planes of GEMs to be built at University of Virginia under the supervision of Nilanga Liyanage. The original plan was to use the INFN/MPD readout system for all GEMs. CERN had developed a GEM readout system called the Scalable Readout System (SRS) which was for relatively small scale experiments. In recent years CERN has developed a large scale version of the SRS and is licensing it to a commercial company. The UVa group has expertise with the SRS system and has used the system in cosmic ray tests at UVa and beam tests at Fermilab and JLab.

Charge

Reports on the INFN/MPD and CERN/SRS readout systems are attached. We would like guidance and a recommendation on which readout system to use for the rear tracker GEMs. The following guidelines for your recommendation:

- Cost comparison is given in the report. Are there missing costs (such as licensing fees)?
- Are the timelines reasonable?
- Capability and integration into JLab standard DAQ software (CODA)?
- Does it meet the technical requirements of 5kHz DAQ rate with 50% occupancy and noise charge of less 3500 e (RMS) averaged over the module.
- Support needed from outside groups to maintain system.
- Ability to upgrade and use in future experiments.