SHMS-HMS Users Group Newsletter

November 2011

Newsletter edited by: M Jones

Contents

SHMS-HMS User's Board

The last meeting of the 2011/2012 Board was on November 2 , 2011. The Hall C Winter workshop will be held Jan 13-14th, 2012. If you have suggestions for talks for the meeting, send them to the board. Steve Wood will email a draft schedule for the commissioning and early running experiments in the next few weeks. This will be discussed in a session at the Winter workshop along with other 12 GeV topics. Another session(s) will be on experiment updates.

If you have any comments, ideas, news, or suggestions on topics related to Hall C at 12 GeV, for instance, on the SHMS-HMS, workshop organization, new grants for 12 GeV physics, student detector projects, or ideas for physics or equipment we would like to hear from you. Simply contact any SHMS-HMS User's Board Member listed below. You could even be featured in the next issue of this newsletter!

Members of the Board: John Arrington (johna@anl.gov), Donal Day (dbd@virginia.edu), Tanja Horn (hornt@cua.edu), Mark Jones(jones@jlab.org), Eric Christy (christy@jlab.org) and Pete Markowitz (markowit@fiu.edu)

Listing of the SHMS Detector "Team"

Contact	Institution	Current Project
Howard Fenker	JLab, Hall C	12 GeV Assistant Project Manager
Donal Day	University of Virginia	Noble Gas Cerenkov
Dipangkar Dutta	Mississippi State University	Collimator
Tanja Horn	Catholic University of America	Aerogel Cerenkov
Garth Huber	University of Regina	Heavy Gas Cerenkov
Hamlet Mkrtchyan	NSL (Yerevan)	Calorimeter
Eric Christy Peter Monaghan	Hampton University	Drift Chambers
Ioana Niculescu	James Madison University	Scintillator Hodoscopes
Charles Perdrisat	College of William and Mary	Support Structure
Abdellah Amidouch Sam Danagoulian	North Carolina A&T	Quartz Hodoscope
Brad Sawatzky	JLab, Hall C	DAQ, Gas system

SHMS Project Update

The Lehman review of the 12 GeV project was held. The review of Hall C went well with no recommendations from the committee. The project and detector construction are progressing. Planning to refurbish the HMS drift chambers is ongoing between JLab and Hampton University. This project could start as early as summer 2012.

Report on SHMS work by the Yerevan group (A. Mkrtchyan)

In the 12 GeV Jlab upgrade , many institutions are involved. Since 1992, the Yerevan group has been working at Jlab and has contributed to a large number of Hall C detectors and experiments. For the 12 GeV Jlab upgrade, the Yerevan group was involved in testing the horizontal bend magnet's heat sensitivity to beam and also is involved in designing, building, testing and (eventually) the installation of the SHMS Calorimeter and Aerogel Detector .

SHMS Horizontal Bend magnet

For the SHMS magnetic system, the key element is the horizontal bend magnet. Expected radiation heat on this magnet required special attention to the cooling power of the magnet cryogenic system and its design. Since simulation of proposed heat based on models and results

vary over a wide range, an experimental test was required for final design. To estimate the radiation heat at 12 GeV, the Yerevan group designed and constructed a prototype of the bender magnet (shown in Fig. 1), and performed experimental studies as well as estimating the magnet heat at beam energy ~6 GeV. The measured average radiation heating was 0.20 +- 0.05W for a 80μA current beam on 4cm LH2 target and ranged between 0.10W and 0.3W for aluminum, carbon and LD2 targets. Extrapolating these measurements from 5 GeV to 11 GeV, the radiation heating in the horizontal bender is expected to be below 1.0W, which is well within the design parameters.

Figure 1 Prototype of the bender magnet used in beam tests.

SHMS Calorimeter

The electromagnetic calorimeter of the SHMS will provide the foundation of the electron identification system in the spectrometer. It is essential to the physics of nearly all experiments which will be carried out at 12 GeV energy with the SHMS. The Yerevan group has taken on the responsibility of assembling and testing the calorimeter for the SHMS. As further background, it should be noted that members of the Yerevan group designed and constructed the electromagnetic calorimeters for both the SOS and HMS spectrometer in Hall C. They have performed full Monte Carlo simulations, developed calibration and analysis code. More recently the Yerevan group has performed detailed Monte Carlo simulations for SHMS calorimeter to predict the performance of the calorimeter. Different versions of the SHMS calorimeter have been studied. The best variant for the calorimeter would be a combination of 2 parts: Preshower + Shower. The simulations predict energy resolution similar to other lead glass calorimeters. Good electron/hadron separation can be achieved by using energy deposition in the the Preshower along with total energy deposition in the Shower. The PID capability is expected to be similar to that obtained with the existing HMS calorimeter. As shown in Fig. 2 ,pion suppression factors of 300:1 to 500:1 are predicted at 99% electron detection efficiency.

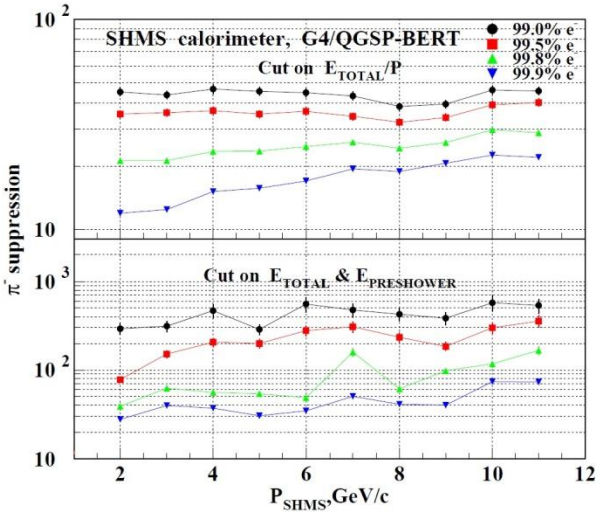

Figure 2 GEANT Monte Carlo simulation of the expected pion rejection for the SHMS calorimeter

The blocks and PMTs for this calorimeter are a contribution to the 12-GeV Upgrade project by Yerevan and NIKHEF. The Yerevan group has also worked on the research and design related to the choice of calorimeter blocks (previously used in the HERMES experiment, as well as the engineering and design. The Preshower detector will consist of calorimeter blocks and PMTs previously used in the SOS spectrometer. Blocks from Hermes calorimeter will be used for Shower part. (Yerevan group members went to DESY, disassembled HERMES calorimeter and brought to Jlab half of calorimeter blocks and PMTs (420 modules). All Hermes blocks are currently tested and refurbished and are ready for installation. Figure 3 shows the blocks in storage. Full testing and refurbishing of the blocks and PMTs from the SOS calorimeter has been performed. The preshower is assembled (as shown in Fig. 4). All PMTs are gain tested for optimal HV and all blocks are tested for transparency and radiation damage. The preshower assembly was tested for light leaks. At the moment, as shown in Fig. 5, we have built one block prototype and are using the prototype to test for best optical contact. We are waiting for electronics for a full scale cosmic test.

Figure 3 The refurbished HERMES lead glass that is ready to be installed in the SHMS.

Figure 4 The SHMS preshower is assembled.

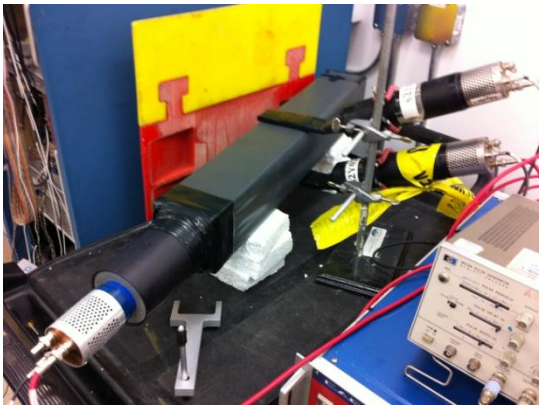

Figure 5 Prototype setup for testing the best optical contact in SHMS preshower.

SHMS Aerogel Detector

The SHMS kaon identification system will consist of a pair of aerogel detectors, essentially clones of the HMS aerogel detector. The Yerevan group had the leading role in the design and construction of the HMS aerogel detector. In collaboration with CUA, we are working on the testing and construction of the SHMS kaon identification system. The Yerevan group performed Monte Carlo studies for the aerogel detector and some preliminary results are shown in Fig. 6.

The Yerevan Group also went to MIT BATES and disassembled BATES BLAST experiment aerogel detector. The aerogel and PMTs were brought to JLab to be used for SHMS aerogel detector. Current status is that testing of the PMTs has begun. As shown in Fig. 7, we have built an aerogel prototype detector to test the aerogel quality. There is still huge work to be done and the Yerevan group has got its hands full with ongoing work in Hall C for QWeak and also the 12 GeV SHMS upgrade.

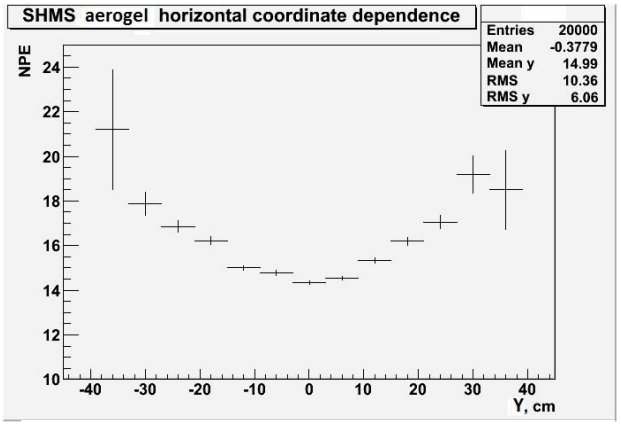

Figure 6 Monte Carlo results for the number of photon electrons detected as a function of the horizontal position

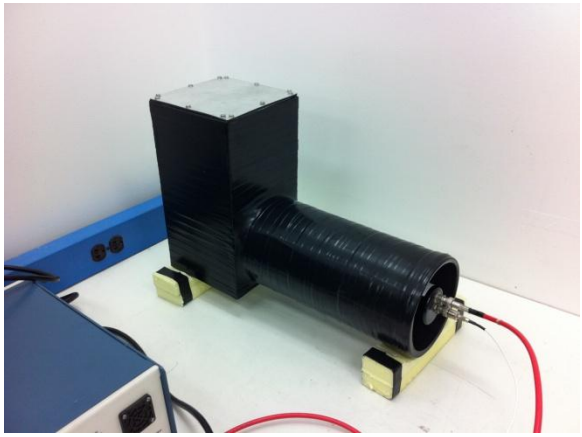

Figure 7 The prototype aerogel detector

Useful Weblinks

Hall C Publications: https://hallcweb.jlab.org/publications/

Hall C Ph.D. Theses: http://www1.jlab.org/ul/generic_reports/thesis.cfm

Hall C Home Page: http://www.jlab.org/Hall-C/

Hall C Wiki: https://hallcweb.jlab.org/wiki/

Hall C 12 GeV Upgrade: http://www.jlab.org/Hall-C/upgrade/

SHMS-HMS Users Group: http://www.jlab.org/Hall-C/upgrade/shms_users_group.html

Previous Newsletters: http://www.jlab.org/Hall-C/upgrade/newsletter.html

Conference listing page: http://cnr2.kent.edu/~manley/BRAGmeetings.html