SHMS-HMS Users Group Newsletter

October 2011

Newsletter edited by: M Jones and P Markowitz

Contents

SHMS-HMS User's Board

The SHMS-HMS User's Board holds regular phone meetings to discuss status and progress of the 12 GeV Upgrade in Hall C, in particular the SHMS as well as physics and other matters associated with Hall C at 12 GeV.

The first meeting of the 2011/2012 Board was on Oct 4, 2011. The new board members Eric Christy and Pete Markowitz were introduced. They are taking over from Garth Huber and Ioana Niculescu. Thanks to Garth and Ioana for serving on the board!

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*
Pete Markowitz *markowit@fiu.edu*

Hall C Summer Workshop was held on August 19-20, 2011

A link to the agenda (including the talks) is at http://wwwold.jlab.org/Hall-C//talks/08_19_11/
One significant part of the meeting was the session on SHMS commissioning and choosing which experiments to run early. Steve Wood is formulating a plan and will send out an email. Another session to discuss the "early run" plan will be at the next User Meeting in January 2012.

The SHMS-HMS User's Board is looking into having the next Hall C User Meeting either Jan. 6-7 or 13-14, 2012. **Please let us know by 1 November if you have a strong preference.**

Along with a session discussing the "early run" plan, there will be the traditional talks on updates on the Hall C experiments. In addition, the Board is thinking about the possibility of a session on physics opportunities in Hall C after the first 5 years of Hall C running. We are aware that there are already enough approved experiments to run beyond the first 5 years of Hall C running, but it is never too early to think about possible experiments that do not use the standard SHMS-HMS. The ideas can be in the conceptual stage. Please contact Tanja Horn (hornt@jlab.org) if you would be interested in presenting your ideas in this session.

Hall C SHMS detector meeting was held on August 18, 2011

A link to the agenda (including the talks) is at

https://hallcweb.jlab.org/doc-private/DisplayMeeting?conferenceid=26

As a reminder the detector team is:

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 10/06/2011 (provided by H Fenker)

While all of the magnets are behind schedule, none of the schedule delays are enough to cause a delay in their installations on the SHMS.

The HB (Horizontal Bend) dipole is about six months behind schedule. Recent activity includes bonding of the coil 'shoes' to the coils, and progress on assuring that the helium vessel conforms to ASME codes. The coils are scheduled for cryogenic tests in mid-November.

The Q1 vendor is once again financially solvent and has negotiated a new set of milestone dates. The original plan anticipated that this quadrupole would arrive quite early and would be tested in the Test Lab rather than Hall-C. The revised schedule shows the magnet arriving in June, 2013. Like the other magnets, it will be tested in Hall-C when it is mounted on the SHMS. The vendor is now making good progress on code certifications and on fabrication of yoke laminations and coil forms. The Intermediate Design Review for this contract was completed in September.

Concerns about the mechanical specifications for the extruded copper stabilizer which will be soldered to the superconducting cable in the Q2, Q3, and dipole magnets have created about a six-month delay in the production of the dipole magnet, and delays of a few months for the quadrupole magnets. The 12GeV Project and the Hall-C Engineering Groups have consumed significant resources to overcome this hurdle, and it appears that agreement and production may proceed in the next couple of months. The vendor continues to work on codes compliance and winding fixtures. A Design Review in support of this contract is to take place in early November.

All of the support-structure steel fabrication contracts are either awarded or ready for award when FY12 funding becomes available. The rails for the SHMS carriage are already on site, as is the main bearing.

Detailed designs for the Shield House, including electronic rack locations, many cable runs, shield-door specifications, penetrations, and so on are progressing. Attention is being paid to the means of installation and service access for the detectors and electronics.

Quartz bars are at NCA&T and have been carefully measured. A test bar is at JLab so that the mounting system for this detector can be detailed. William and Mary has completed construction of the stands for the S1X/Y scintillator hodoscopes, and assemblies have been successfully test fit. JMU is in the final stages of testing and calibrating these detector elements.

The drift chambers are still held up by problems with the printed-circuit board fabrication vendor. This vendor discovered that they needed a new machine in order to honor their contract to produce our rather large boards. The machine delivery is now forecast for December. The first of the drift chamber boards is expected to arrive at Hampton University in late January, 2012. Meanwhile, Hampton is processing the purchases of chamber components, and improving their chamber-handling and wire-placement jigs.

Formal agreements between JLab and UVa are nearing conclusion in preparation for beginning the Noble Gas Cerenkov construction in January. The Heavy Gas Cerenkov vessel is scheduled for an engineering review in December. Mirror blanks for this detector have been procured and tested by Regina, and preparations are underway for aluminizing and then measuring the reflectance of these mirrors before a final decision is made about the choice of aluminization vendor. Tests of PMTs and bases are in progress at CUA for the Aerogel Cerenkov, the detector box fabrication has begun, all parts procurements have been initiated, and they are investigating options for a third supply of aerogel.

Preshower lead-glass modules (from the SOS) have been tested, refurbished, and wrapped by the Yerevan group. They are now stacked on the preshower frame, awaiting construction of the SHMS Shield House so that they can be mounted. The HERMES modules were tested and refurbished some time ago. They, too, are in storage in the EEL building at JLab, ready for installation in 2013.

Progress on SHMS Support Structure (provided by C. Perdrisat)

Charles Perdrisat provided photos of recent progress on the SHMS support structure for the scintillator plane and the quartz hodoscope. As Charles presented at the Aug 18th detector

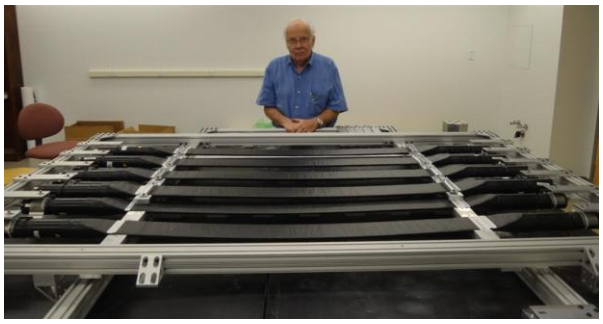


Figure 1: *Charles behind the JMU scintillator bars installed in their mounting frame which was designed and built at W&M.*

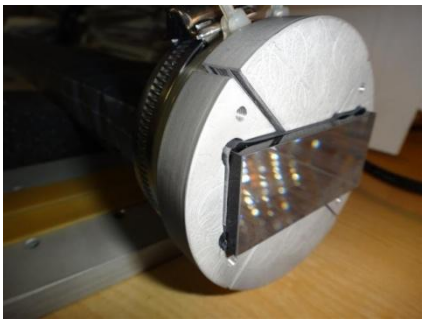


Figure 2: *At the end of a rectangular quartz bar, a prototype photomultiplier tube mounting bracket has been attached.*

meeting, a nine S1X/Y scintillators bars from James Madison were brought to William and Mary and installed on their mounting frame (see Fig. 1). For the plane of quartz bars, Charles presented an idea from mechanical attaching the photomultiplier to the quartz bar at the August 18th meeting. Since the meeting, Charles has completely rethought the design. A quartz bar was brought from NCA&T to W&M and a prototype mounting attached to the bar is shown in Fig. 2.

SHMS Drift Chambers at Hampton (provided by Eric Christy)

While waiting for the final printed circuit boards, Hampton University is working on stringing a mock prototype chamber to train students and standardized procedures for building the chambers. Below are photos of the stringing process. When the boards arrive, everything will be ready to start production!

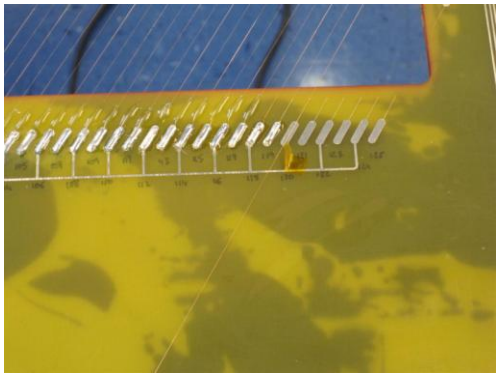
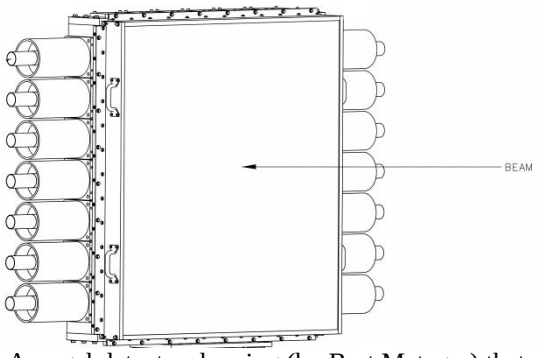


Figure 1 Close up view of the strung wires in a mock prototype drift chamber board.

Figure 2 Hampton University graduate student Jamil Taylor inspecting the position of the soldered wires.

SHMS Kaon Aerogel Cerenkov Detector (by M.A.P. Carmignotto)

The SHMS aerogel Cerenkov detector is under construction by a collaboration of researchers lead by the Catholic University of America, under supervision of Dr. Tanja Horn. The members of the consortium are the University of South Carolina, Mississippi State University, Florida International University, and, as unfunded partners, the Jefferson Lab and the Yerevan Physics Institute. The project is funded through NSF grant PHY-1039446.

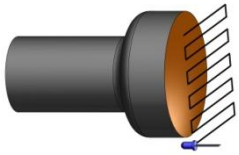


Aerogel detector drawing (by Bert Metzger) that is being constructed at the Catholic University of America

The design is based on proven technology and benefits from many years of experience that JLab acquired on the usage of aerogel detectors. The required materials for the detector have been purchased and the first piece of this detector started to be milled in the CUA machine shop last week!

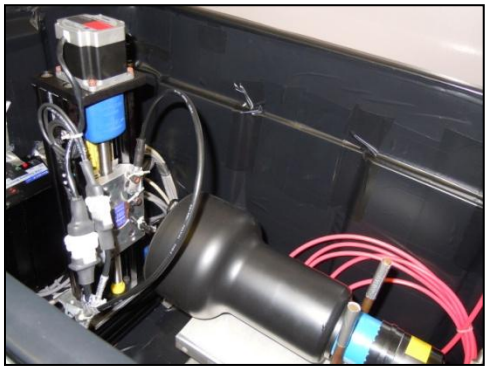
The detector will feature three trays of aerogel, each with a different refractive index. This design will provide the flexibility to change the threshold on the momentum selection of the particles, and thus cover the full kinematic range needed by the experiments. Aerogel material of two refractive indices is already at hand.

In parallel to the construction of the detector box, evaluation and characterization of the PMTs and aerogel material is ongoing. New sets of tools for the characterization are being developed at CUA. Undergraduate students Laura Rothgeb, Nathaniel Hlavin and Michael Metz are working on the preparation of some of these tools for the simulation of the detector and the characterization of all the PMT's. Graduate student Marco Carmignotto joined this effort at the end of the summer and is also overseeing the construction of the detector box.



Scanning pattern across the PMT surface. The LED flashes at discrete points along the lines.

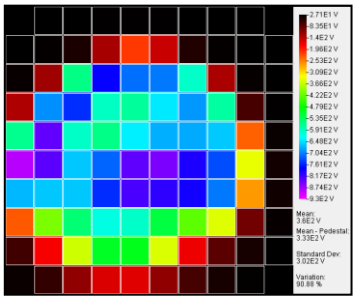
One of the tools the group has developed is a device to measure the position dependence of light collection across the surface of large-diameter PMTs. The setup consists of an x-y positioning table, equipped with stepper motors, and scans the front of the PMT flashing a LED on it.



PMT characterization – Incident light position dependence experiment

The first data using this device have been acquired and are being analyzed by the students. A representative data plot (not yet calibrated) is shown to illustrate the typical results from the scanning.

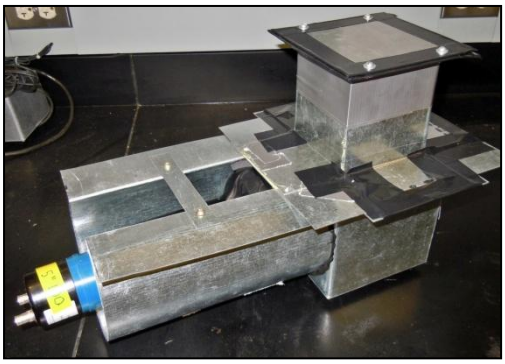
These tests are a great opportunity for teaching the students about nuclear physics



First results on the response of the PMT to the

instrumentation. position of the flashing LED

Another device the group is developing is a prototype of the aerogel detector, which is effectively a scaled-down version of the detector. Just one PMT is mounted to the "diffusion box" of this detector to measure the Cerenkov radiation signal due to cosmic rays passing though the aerogel.



Prototype of the Aerogel detector for preliminary studies and detector simulation calibration.

This prototype is going to provide calibration data for a simulation that is under development for the SHMS aerogel detector. This simulation is being performed using the GEMC code, which uses the GEANT4 framework.

Over the next half year the group is going to develop additional tools to analyze the characteristics of the aerogel tiles. For instance, each block will be tested for the light absorption and refractive index.

The procedures and results will be reported in the wiki of our research group at http://vsl.cua.edu/cua_phy/ on the "Kaon Aerogel Cerenkov Detector" page. You are welcome to visit it!

SHMS in SIMC

A SIMC MC Working Group has formed to finalize the SHMS in SIMC. This will help with the final SHMS collimator design. The plan is to have a new version of SHMS in SIMC by the beginning of December. No major changes are expected, but a proposed experiment can make another run through of their expected rates. The web site is at https://hallcweb.jlab.org/wiki/index.php/SHMS_MC_Working_Group. Anyone who wants to get involved contact Mark Jones (jones@jlab.org).

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