# Hall C

#### Mark Jones, Hall C Staff

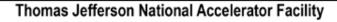
#### **Overview**

Jefferson Lab

- In first 3 years of running, experiments will use the existing High Momentum Spectrometer (HMS) and the new Super High Momentum Spectrometer (SHMS). SHMS replaces the Short Orbit Spectrometer (SOS).
- HMS and SHMS have similar detector packages: Drift Chambers, Scintillator hodoscope, gas Cerenkov, Aerogel, Lead-glass calorimeter.
- After 2018, several experiments use new apparatus: neutron polarimeter, neutral meson spectrometer, backward angle hodoscope as 3<sup>rd</sup> arm.

#### **Status and Timeline**

- SHMS carriage, detector hut constructed. Calorimeter installed.
- Installation of hodoscope soon with other detectors to follow.
- Q1 magnet installed. HB to be installed in March. Construction of other magnets on schedule.
- Beam commissioning in Fall 2016 (Shift from Feb 2016)





## Goal of Hall C 12 GeV Software

Main goal is to have online/offline software ready for start of experiments.

To achieve this goal decided:

 Develop a Hall C specific standalone C++ library that utilizes the existing Hall A PODD C++ library. Use the existing well-tested Fortran code (ENGINE) as basis for the C++ library.

#### Management Structure

| Activity             | Person            | Institute                   |
|----------------------|-------------------|-----------------------------|
| Software Manager     | Mark Jones        | Jefferson Lab               |
| C++/ROOT Analyzer    | Gabriel Niculescu | James Madison University    |
| Calibrations         | John Arrington    | Argonne National Lab        |
| Online histogramming | Pete Markowitz    | Florida International Univ. |
| Simulation (SIMC)    | David Gaskell     | Jefferson Lab               |





## **HMS and SHMS comparison**

| HMS detector   | SHMS detector  | Comment   |
|--|--|---|
| Front X-Y scintillator plane<br>Rear X-Y scintillator plane                  | Front X-Y scintillator plane<br>Rear X scintillator plane<br>Rear Y quartz plane | Same code<br>Same code<br>New code                    |
| Drift Chamber  | Drift Chamber  | SHMS DC based on<br>Hall C SOS DC design              |
| Gas Cerenkov   | Noble Gas Cerenkov<br>Heavy Gas Cerenkov   | Same code   |
| Aerogel  | Aerogel  | Same code   |
| Lead Glass Calorimeter<br>4 columns oriented<br>perpendicular to central ray | Pre Shower Column<br>"Fly's Eye" Arrangement of<br>Calorimeter                   | New code. SHMS is<br>similar to Hall A<br>Calorimeter |

Test new HMS code against original Fortran code (ENGINE) using 6 GeV HMS data

Test new SHMS code against original Fortran code (ENGINE) using 6 GeV SOS data





### **Present Status**

- HMS Drift Chamber tracking code is working. Added best track selection and tracking efficiency code. In depth comparison of tracking efficiency in progress.
- HMS hodoscope, gas Cherenkov, aerogel and calorimeter coding and comparisons completed.
- SOS (Same as SHMS) drift chamber tracking working with comparisons completed.
- Hall C report templates added to code.
- PODD updated Event Decoder and added new Event Handler. Working to implement Hall C scalers and EPICS into HCANA.
- Using git for version control and Github as repository server.
- SCONS for building code. (Still have Make available. Hope to phase out)
- Documentation on Hall C wiki to allow users to get involved.
- Nightly builds







## **2014 Milestones Status**

Jan: Hall C specific BPM/Raster code. Hall C report templates Completed Mar: Implement Hall C scalers. Work in progress June: Complete documentation of Fortran code. Work in progress July: HMS Calibration codes ready. Calorimeter and drift chambers done. Optics and hodoscope just starting. Aug: HMS Online histogramming ready Work in progress Oct: Test software for SHMS calorimeter with FADC. Code compatible with PODD in place. Need to integrate in HCANA. Dec : Full analysis of HMS data with C++ Analyzer verified by comparison to Fortran analyzer. Completed HMS detector comparison. Working on physics comparison. Dec: Nightly builds Completed





## **Updated Milestones**

2015

May: Complete HMS ENGINE/HCANA physics comparison June: Complete HMS/SOS ENGINE/HCANA coincidence comparison June: HMS Online histogramming ready Aug: HMS/SHMS Calibration codes ready. Sept: SHMS Calorimeter Calibration code ready. Oct: C++ Analyzer ready for SHMS detector package. Dec : Analyze cosmic ray data in SHMS





## **Response to Recommendations**

| Recommendation   | Response   |
|--|--|
| Adoption of code evaluation tools  | <ol> <li>Cppcheck is part of SCONS build.</li> <li>Using Valgrind intermittently.</li> </ol> |
| Consider code reviews  | Rely on Hall A experts to review code.<br>Use PODD as example and<br>framework.              |
| Software workshops and tutorials   | Annual workshops. Wiki pages.  |
| Looking at TagFS as a potential tool for file metadata and data discovery  | Decided not to use.  |
| Provide a generic mechanism to capture the available monitoring histograms and other output at the end of a data acquisition run.                                | Standard practice.   |
| Effort should be made to identify personnel<br>capable of extending the Hall C Software<br>migration to full tracking, calibration, and<br>physics calculations. | See next slide   |





### Personnel

| Task                                 | Personnel  |
|--------------------------------------|--|
| Comparison of HMS physics quantities | Ioana and Gabriel Niculescu, JMU                         |
| HMS and SHMS histogramming           | Pete Markowitz and student, FIU                          |
| Optics calibration                   | Ed Brash and students, CNU                               |
| Tracking Efficiency                  | Ahmed Zafar, Regina                                      |
| Comparison of HMS/SOS coincidence    | Dipangkar Dutta, MSU                                     |
| SHMS calorimeter                     | Simon Zhamkochian, Yerevan<br>Vardan Tadevosyan, Yerevan |
| HMS/SHMS Hodoscope calibration       | Ahmed Zafar, Regina                                      |





### **Deep Dive Session**

- "Hall C: Deep Dive", Gabriel Niculescu, JMU
- Users available for questions:
  - Ed Brash, CNU
  - Simon Zhamkochyan, Yerevan
  - Dipangkar Dutta, MSU



