Hall C

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Overview

- 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 3rd arm.

Status and Timeline

- SHMS carriage is on the pivot and detector hut is being constructed.
- Magnets being built. Installed in late 2014 thru 2015.
- Beam commissioning in Feb 2016 (Shift from April 2015)

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.

- Decided to eliminate the previous goal of implementing SHMS into the Fortran-based code
- Two reasons:
  - Committee recommendation: **If resources are limited, the Fortran-based SHMS reconstruction should be a low priority**
  - More time: Beam commissioning has shifted to Feb 2016

HMS and SHMS comparison

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

Progress on Milestones

2012

July : Define reference HMS data for testing code

- Using data from “Jan05” experiment

Sep : Documented non-tracking HMS detectors code in Fortran Analyzer

- Calorimeter done and other detectors almost complete

Oct : Make DAQ decoding in C++ Analyzer object-oriented

- Started by Bob Michaels in Hall A

Oct : Ability to analyze Hall C data at the raw data level in C++ Analyzer

- Done

Dec : Documented the drift chambers and tracking code in Fortran Analyzer

- 25% complete.

Dec : Verify HMS hodoscope analysis in C++ Analyzer

- Done (as far as could be without tracking)

Progress on Milestones (part 2)

2013

Jun : SHMS code added to Fortran Analyzer

- Decide not to do since expecting beam to Hall C in 2016

July : Full analysis of HMS data with C++ Analyzer ready

- Drift Chamber tracking code ready.

Sep : C++ Analyzer ready for SHMS calorimeter tests.

- Moved date since expecting beam to Hall C in 2016

Dec : Full analysis of HMS data with C++ Analyzer verified by comparison to Fortran analyzer.

- Moved date since expecting beam to Hall C in 2016

Present Status

- HMS Drift Chamber tracking code is working and comparisons to Fortran analyzer have been done. Need to add best track selection and tracking efficiency code.
- Now with tracking done, HMS hodoscope and calorimeter coding and comparisons can be finished.
- HMS gas cerenkov and aerogel comparisons in progress.
- Using git for version control and Github as repository server. Github is easier for offsite users and has tools for communication and tracking issues and milestones.
- Added the ability to use SCONS for building code to eventually replace Make. Makes it easier to build on different platforms.
- Documentation on Hall C wiki to allow users to get involved.
- Integrating Hall C scalars into PODD.
- Adding Hall C report templates.

Updated Milestones

2014

Jan: Hall C specific BPM/Raster code. Hall C report templates

Mar: Implement Hall C scalers.

June: Complete documentation of Fortran code.

July: HMS Calibration codes ready.

Aug: HMS Online histogramming ready

Oct: Test software for SHMS calorimeter with FADC.

Dec : Full analysis of HMS data with C++ Analyzer verified by comparison to Fortran analyzer.

Dec: Nightly builds

2015

June: C++ Analyzer ready for SHMS detector package

June: SHMS Online histogramming ready

Aug: SHMS Calibration codes ready.

Sept : Analyze cosmic ray data in SHMS

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

Response to Recommendations

Recommendation	Response
Engage a reasonable number of early adopters to stress test the new framework	Biweekly meetings. Examples on wiki.
Re-use existing efforts from Hall A to decode CODA-formatted data in ROOT	Done by Oct 2012
If resources are limited, the Fortran-based SHMS reconstruction should be a low priority.	Agree and decide not to add SHMS to Fortran code
git for version control: **1) Identify a workflow model** **2)Communicate clearly the new paradigm** **3)Set up (or link to) tutorials for users**	Info on wiki and presentations at workshops. More details in breakout session
Nightly builds	Dec 2014 Milestone
Run a code validation	Investigating
File management, cataloging and data discovery	Develop by IT group Talk by S. Philpott

Breakout Sessions

- “Comparisons between HCANA and ENGINE”, Gabriel Niculescu, JMU
  - Details on implementation
  - Comparison histograms for Drift chambers, scintillators, gas cerenkov and calorimeter.
- "Hall C General Updates and additions to PODD“, Ed Brash, CNU
  - User’s interaction with *git* version control
  - *SCons* to replace *make* as the build tool.
- Discussions with users:
  - Eric Christy (Hampton University)
  - Simon Zhamkochyan (Yerevan Physics Institute)
  - Ahmed Zafar (University of Regina)