Jefferson Lab
Thomas Jefferson National Accelerator Facility

Super-Bigbite-Spectrometer (SBS)

Quarterly Progress Report

April 15, 2017

A quarterly report progress report on the SBS experiments

- The Experimental Readiness Review (ERR) for the neutron magnetic form factor experiment has been scheduled for June 15 and 16th. The charge for the ERR is given in Appendix I.
- The Transition-to-Operations document was sent to DOE at the end of February 2017.
- Updates on the SBS dependencies are given in the following pages.

SBS Dependencies

GRINCH from W&M/NCCU/JMU (for GMN and GEN)

Milestone	Scheduled date	Comment
Design and drawings for vessel are complete	Feb 1, 2015	**Completed Feb 2015**
Photon Detector Array assembled and tested	Aug 1 , 2015	**Completed Nov 2016**
NINO chip front end cards system shipped to JLab	Jul 1, 2015	**Completed Oct 2015**
Purchase order issued for vessel	Oct 15, 2015	**Completed Aug 2015**
Full DAQ system ready	Dec 1, 2015	Expected June 2017
Vessel completely assembled	Mar 15, 2016	**Completed Sept 2016**
GRINCH ready for installation	Jun 15, 2016	Expected June 2017
Final analysis software complete	Jun 15, 2016	Expected Sept 2017

Status update:

- Installation of PMTs in the PDA will be completed by the end of April.
- HV and signal cables have been finished and labeled.
- Installation of light cones, windows and mirror will be completed by June.
- A prototype DAQ system was tested and the decision was made to use a JLab custom VME module called a VETROC which is a TDC that can also be used as part of the trigger if needed.

HCal-J from CMU/INFN-Catania (for GMN, GEN and GEP)

Milestone	Completion date	Comment
Detailed design completed	June 2014	**Completed July 2014**
Design review	Sept 2014	**Completed Dec 2014**
Module construction initiated	Mar 2015	**Completed Mar 2015**
Module assembly 25% complete	Sept 2015	**Completed Sept 2015**
Module assembly 50% complete	Mar 2016	**Completed April 2016**
Module assembly completed	Sept 2016	Expected in May 2017

Status update:

- Module production is ongoing. Have produced 245 modules (235 modules at JLab) of the total of 288 modules in HCAL.
- 7 modules were completed. 36 modules are partially assembled and only need to be filled with scintillator and iron.
- Expect delivery to JLab of the final group of modules in May.
- The lifting mechanism needed to assemble the modules into their frames has been set to procurement at JLab and will be awarded by April 14th. The expected delivery date is in early June. Assembly of modules in their frame will begin after delivery.

Front Tracker from INFN (for GMN, GEN and GEP)

Milestone	Completion date	Comment
Electronics in production	Sept 2014	**Completed Sept 2014**
GEM chambers 1 and 2 completed	Sept 2015	**Completed Dec 2015**
Initial Electronics QA completed	Dec 2015	**Completed Dec 2015**
GEM chambers 3 and 4 completed	May 2016	Expect delivery in May 2017
GEM chambers 5 and 6 completed	Dec 2016	Expect in Dec 2017

Status update:

- The following table is a summary of all modules.

Module	**Comment**
#1	Chamber 1 at JLab
#2	Chamber 1 at JLab
#3	Chamber 1 at JLab
#4	Chamber 2 at JLab
#5	Chamber 2 at JLab
#6	Chamber 2 at JLab
#7	Retested and found low efficiency sectors
#8	Passed QA cosmic tests
#9	QA cosmic and X ray tests on hold (found one sector protective resistor remover, one sector with low efficiency need investigation
#10	Passed QA cosmic tests
#11	QA cosmic and X ray tests on hold (1 sector protective resistor removed, one sector low efficiency need investigation)
#12	QA cosmic and X ray tests on hold (1 sector protective resistance removed, one sector low efficiency need investigation)
#13	Passed QA cosmic tests
#14	Ready for gas and HV training in Rome
#15	Ready for gas and HV training in Rome
#16	Under construction at Catania (on hold due to missing one fiber glass frame)
#17	Under construction at Catania (on hold due to missing one fiber glass frame)
#18	Materials on-hand

- At Rome, the X-ray source has been completed. This will speed up tests for fixes to problem modules.
- Three modules (8,10 and 13) have passed cosmic tests and will be used for chamber 3. The three modules for chamber 4 are undergoing investigations which will proceed more quickly with the X-ray source.

- The delivery date for chamber 5 and 6 has been delayed until Dec 2017, since these chambers are only needed for the GEp experiment and the focus is on preparing the modules needed for the GMn experiment that will be in the ERR process in June 2017.

ECal from JLab/NCCU/SBU/JMU (for GEP)

Milestone	Completion date	Comment
Light guide procurement	Jan 2017	**Completed Jan 2017**
Mechanical design for main frame	Feb 2017	Expected May 2017
Start gluing of light guides to leadglass blocks	Mar 2017	Expected May 2017
Super module procurement	Apr 2017	Beginning of May 2017
Main frame procurement	June 2017	
Detector assembly in main frame starts	Sept 2017	
Detector testing in the main frame starts	Oct 2017	**Critical decision**
Connection of Signal and HV cables	Dec 2017	
Finished first pass cosmic tests	Apr 2018	

Status update:

- The delivery of the light guides have been shipped and delivery to JLab is scheduled for April 14th.
- Preparation of the 250 lead glass blocks has been completed with ongoing work on preparation of the remaining blocks.
- Weekly meetings on the design of the main frame are continuing with main frame procurement on track for June 2017.
- The detailed design of the supermodule has been completed and preliminary vendor quotations were obtained. The supermodule procurement is expected in the beginning of May.

Polarized ^{3}He target from UVa (for GEN)

Milestone	Completion date	Comment
Selection of target-cell design for high luminosity	Nov 2014	**Completed Oct 2014**
Conceptual design document complete	Jan 2016	**Completed Mar 2016**
Conceptual design review	Mar 2016	**Completed Mar 2016**
Start bench test of 3 liter glass convection target	April 2016	**Completed Aug 2016**
Conceptual design frozen	June 2016	**Completed Oct 2016**
Test of glass/metal technology complete	June 2016	**Completed July 2016**
Begin engineering and design	July 2016	**Completed May 2016**
Bench test of 3 liter glass/metal target	Jan 2017	Expect April 2017
Simulated beam test on the bench for full scale 6 liter cell	Sept 2017	
Begin production of full-scale cells	Nov 2017	
Engineering complete	Jan 2018	
Design of target hardware and instrumentation complete	June 2018	After CDR review updated to July 2018
Target is ready for installation	Jan 2019	

Status update:

- Design and engineering work at JLab is ongoing and on schedule. Engineering and design of the main target mount and holding field using Helmholtz coils have been completed.
- An annual internal review of the JLab/UVa work on the polarized target will be held on April 19th. The review will cover the status of the milestones set out at the polarized target meeting of March 2016.

Appendix I

Jefferson Lab
Thomas Jefferson National Accelerator Facility
Exploring the Nature of Matter

Hall A E12-09-019 Experiment Readiness Review
Jefferson Lab June 15-16, 2017

Charge

1. Has the entire beamline, spectrometers, detector configuration been defined, including ownership, maintenance and control during beam operations?
2. What is the status of the equipment towards operation? What are the completion/commissioning schedule and tasks?
3. Are the responsibilities for carrying out each job identified, and are the manpower and other resources necessary to complete them on time in place?
4. Provide the target and scattering chamber configuration and requirements.
5. Have the specific equipment been demonstrated for readiness to operate the spectrometers (SBS and BigBite) and to achieve the scientific goals of the experiment? This includes demonstrating:
    a. GEM reconstruction efficiency at high rate
    b. High trigger rate capabilities. What are the expected accidentals?
    c. Determination of calibration efficiency.
6. Is the beam delivery affected by the running configuration of BigBite and SBS? If yes, have the fringe field effects been properly mitigated?
7. Are the beam commissioning procedures and machine protection systems sufficiently defined for this stage?
8. Are the radiation levels expected to be generated in the hall acceptable? Is any local shielding required to minimize the effects of radiation in the hall equipment?