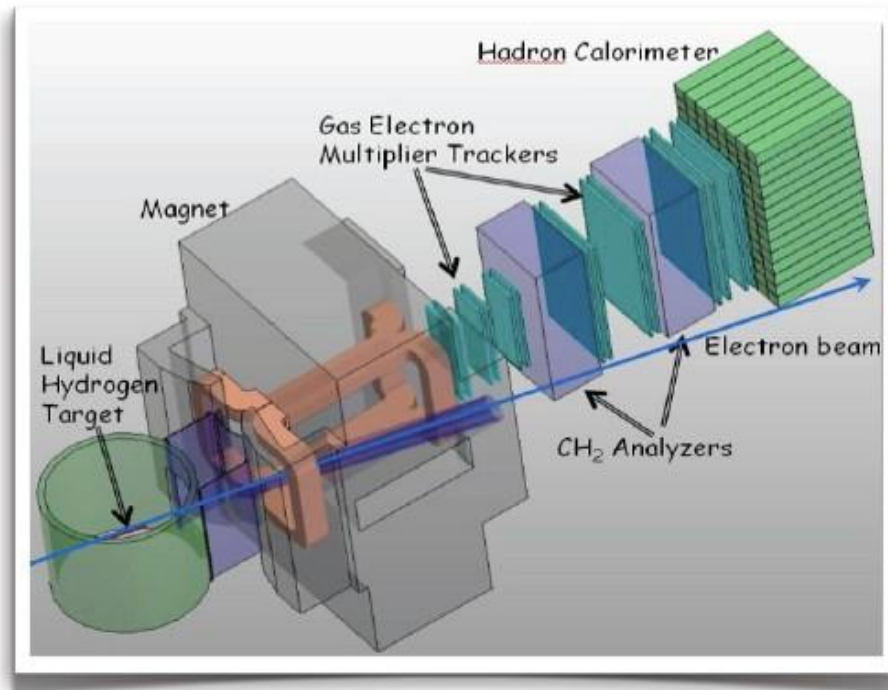


Super-BigBite-Spectrometer (SBS)

Monthly Progress Report

July 15, 2014



Introduction:

The SBS Program consists of three separate, but interrelated Projects.

- The first Project, **SBS Basic (WBS 1)**, involves the acquisition of an existing magnet and the associated work of preparing it for use during the SBS research program. The effort includes modifications to the magnet, including machining a slot in the yoke for beam passage, field clamps, and a solenoid to reduce the transverse magnetic field on the beam line, the design and development of the infrastructure needed to run the magnet, and the construction of the platform on which it will stand.
- The second Project, **Neutron Form Factor (WBS 2)**, involves the construction of The PMT-based Coordinate Detector (CDet), trigger electronics for the Hadron Calorimeter (HCal) to meet the requirements of the approved neutron form factor measurements.
- The third and final Project, **Proton Form Factor (WBS 3)**, involves the construction of forty GEM detector modules with associated front-end and DAQ modules to meet the requirements of the approved proton form factor measurement.

Project Management Highlights:

This is the 22nd Monthly Progress Report for the SBS Program.

The first and second Projects within the SBS Program, SBS Basic (WBS 1) and Neutron Form Factor (WBS 2), started at the beginning of FY14. The third project SBS Proton Form Factor (WBS 3) started on October 1, 2012.

- GEM Electronics report has been completed for the INFN MPS and CERN SRS electronic systems. The charge for a review committee has been written with main task to give advice on which electronics system to use for the UVa rear tracker GEMs. The plan is for the review committee to consist of two outside experts and one person from the JLab DAQ group. The review will be done by email.
- SBS Collaboration meeting will be held at JLab on July 7 and 8th.

WBS 1: SBS Basic

WBS 1	SBS Basic: (Hall A Infrastructure)	WBS 1.01	Milestones
		WBS 1.02	Project Oversight
		WBS 1.1	Magnet, power and construction
		WBS 1.2	Magnet/detector platforms
		WBS 1.3	Beam line

WBS 1.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on June 4,11,18 and 25th. Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this stage, and includes a Jefferson Lab manager, scientist, and magnet engineer.

WBS 1.1 Magnet, Power and Construction:

- Coils:
 - Racetrack coils: Robin Wines and Ed Folts visited Technicoil for inspection of coils. Four coils have been wound. Two coils are ready for shipment and are expected by end of July.
 - Saddle coil: Decision on purchasing coil will wait until more items are obligated, such as exit beam pipe (WBS 1.3) and power related purchases (WBS 1.1). Expect to be ready for decision in two months. Plan to use existing coil for summer testing.
- Procured most of magnet assembly hardware. One piece left to order. Coil assembly hardware has been ordered.
- Scheduled inspection by JLab engineer of power supply at Danfysik on July 16th. Scheduled to ship on July 19th and to receive supply by mid August. The change by two weeks has no effect on project, since supply will not be used in TestLab magnet test.
- In TestLab, work is ongoing to assemble of the magnet and prepare the LCW and power to test magnet.
- Purchases for Hall A power upgrade have started. Plan to complete the upgrade by Oct 1.

WBS 1.2 Magnet/Detector Platforms:

- Delivery in November 2014. This is 4 months past the scheduled date, but item has large float.

WBS 1.3 Beam Line:

- Initial costing of exit beam pipe was found to be \$15K over the cost in the PMP. A simplifying redesign has been done and is out for costing.
- Design of scattering chamber snout is complete and is out for costing.

WBS 1 Costs:

- The budget for this WBS for FY14 is \$643K. The incremental budget (FY13+FY14) is \$1,481K
- Costed and obligated as of 7/1/2014: \$817K (55%).

WBS 1.01 Milestones: (see [Appendix 1](#) for graphic view of milestones)

Level (ID#)	Milestone	Scheduled Date	Expected Date 6/1/2014	Expected Date 7/1/2014	Comment
1 (1.1-01M)	Project start	10/1/2012			Completed 10/1/2012
2 (2-01M)	Magnet delivered to JLab	4/30/2013			Completed 8/21/2013
3	Power supply received	1/4/2014	7/31/2014	8/15/2014	Expect shipment July 19 th Two week shift has no effect on schedule
3	Magnet yoke modifications Completed	4/1/2014			Completed 5/22/2014
2 (1.2-10M)	Platform parts received	6/27/2014	11/1/2014	11/1/2014	Bid awarded. Expect delivery 11/1/2014. Platform is not needed for test in the Testlab.
3	Assemble magnet in Testlab	7/1/2014	7/1/2014	8/1/2014	Start on assembly in July
3	Commissioning test of magnet in Testlab completed	10/1/2014	10/1/2014	10/1/2014	
3	Beampipe solenoid correctors received	1/5/2015	1/5/2015	1/5/2015	
3	Detector supports completed	4/1/2015	4/1/2015	4/1/2015	
2 (1.2-30M)	Beam-line parts received	9/24/2015	9/24/2015	9/24/2015	
1 (1.1-10M)	Project completion	1/29/2016	1/29/2016	1/29/2016	

WBS 2: Neutron Form Factor

WBS 2	Neutron Form Factor	WBS 2.01	Milestones
		WBS 2.02	Project oversight
		WBS 2.1	Coordinate Detector (ISU)
		WBS 2.2	Electronics Hut, Lead Shielding, Lead platform, and Detector Frames (JLab)
		WBS 2.3	Pole Shims and field clamp (JLab)
		WBS 2.4	Trigger (RU)

WBS 2.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on June 4, 11, 18 and 25th . Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this stage, and includes Jefferson Lab (manager, scientist) and Idaho State University (one scientist).

WBS 2.1 Coordinate Detector (ISU):

- Contract with ISU for construction of the coordinate detector has been submitted to procurement.
- The coordinate detector frame construction has been included in the contract with ISU. This will move the PMP planned \$61K for FY15 forward to FY14.
- The Statement of Work with Fermilab for production of the scintillator bars nearly complete.
- Procurement of the level translators and trigger interface cards completed.

WBS 2.2 Electronics Hut, Lead Shielding & platform, and Detector Frames:

- Activity will start in FY15 as planned in the PMP.

WBS 2.3 Pole Shims and field clamp:

- When the exit beam line design is completed, this project can move forward.

WBS 2.4 Trigger:

- Purchasing will start in FY15 as planned in the PMP.

WBS 2 Costs:

- Budget for this WBS for FY14 is \$599K.
- Costed and obligated as of 7/1/2014: \$421K (70%).

WBS 2.01 Milestones: See [Appendix 1](#) for a graphic view of the milestones .

Level	Milestone	Scheduled Date	Expected date 6/1/2014	Expected date 7/1/2014	Comment
1	Project start	10/1/2013			Completed 10/1/2013
3	Scintillator and Wavelength Shifting Fibers ordered	7/30/2014	7/30/2014	7/30/2014	
3	Finish testing of module prototype	8/30/2014	8/30/2014	8/30/2014	
3	Scintillator shipped for machining	10/30/2014	10/30/2014	10/30/2014	
3	Complete plastic absorber structure design	11/15/2014	11/15/2014	11/15/2014	
3	Begin assembly of modules	12/15/2014	12/15/2014	12/15/2014	
3	Begin construction of plastic absorber structure	1/15/2015	1/15/2015	1/15/2015	
2	Coordinate Detector assembled	3/30/2015	3/30/2015	3/30/2015	
2	JLab receives exit field clamp	6/2/2015	6/2/2015	6/2/2015	
2	Electronics Hut Assembled	10/2/2015	10/2/2015	10/2/2015	
2	Trigger completed	10/4/2015	10/4/2015	10/4/2015	
1	Project completion	1/29/2016	1/29/2016	1/29/2016	

WBS 3: Proton Form Factor

WBS 3	Proton Form Factor	WBS 3.01	Milestones
		WBS 3.02	Project Oversight
		WBS 3.1	GEM's (UVa)
		WBS 3.2	GEM electronics (UVa)

WBS 3.02 Project Oversight:

- SBS weekly meetings, via tele and video conference were held on June 4,11,18 and 25th . Participants included Jefferson Lab, University of Virginia, Carnegie-Mellon University, William and Mary, Norfolk State University, University of Connecticut, University of Glasgow, Saint Mary's University, Idaho State University, and INFN Rome.
- Project is staffed appropriately for this beginning stage, and includes Jefferson Lab (manager, scientist) and UVa (two scientists).

WBS 3.1 GEMs

- All frames for the next module (SBS 3) have been prepared. However, as noted in previous report, one of the sectors in one foil has high current indicating a possible short and we have to wait for the next batch of foils to assemble this module. UVa received notification from CERN that the next batch of foils will be shipped on July 18th. The plan is to assemble the next 3 chambers soon after that.
- The schedule for production of the 40 GEM modules has been revised assuming a production rate of 2 modules per month. This moves the production deadline of the forty modules by 8 months for March 2016. There is a large float of 11 months between end of module production and the end of the project. As stated in previous reports, UVa has shown the capability to produce two modules in two weeks, so the rate of two modules per month in a conservative number.
- In the meantime, UVa continued testing the first two production modules. As UVa presented in the SBS weekly meetings, the data taken with the prototypes, and now with production modules, indicate two issues that need to be addressed. One was electrostatic attraction

between the gas window and top cathode plane. A simple solution is to add a grid spacer between the window and cathode plane. The other problem was deformation of the readout plane under high gas flow rates in the module. A proposed solution is to have a thin gas window below the readout plane and fill it with gas to equalize the pressure between the front and back of the readout plane. Both solutions are being investigated and are estimated to increase the cost of a module by 1%.

- The contract with UVa for the production of final 11 GEM modules is in procurement. This will move the PMP planned FY15 procurement of \$329K forward to FY14.

WBS 3.2 GEM electronics

- GEM Electronics report has been completed for the INFN MPS and CERN SRS electronic systems.
- The charge for a review committee has been written with main task to give advice on which electronics system to use for the UVa rear tracker GEMs. The plan is for the review committee to consist of two outside experts and one person from the JLab DAQ group. The review will be done by email.

WBS 3 Costs:

- Budget for this WBS for FY14 is \$665K. The incremental budget (FY13+FY14) is \$709K.
- Costed and obligated as of 7/1/2014: \$616K (87%)

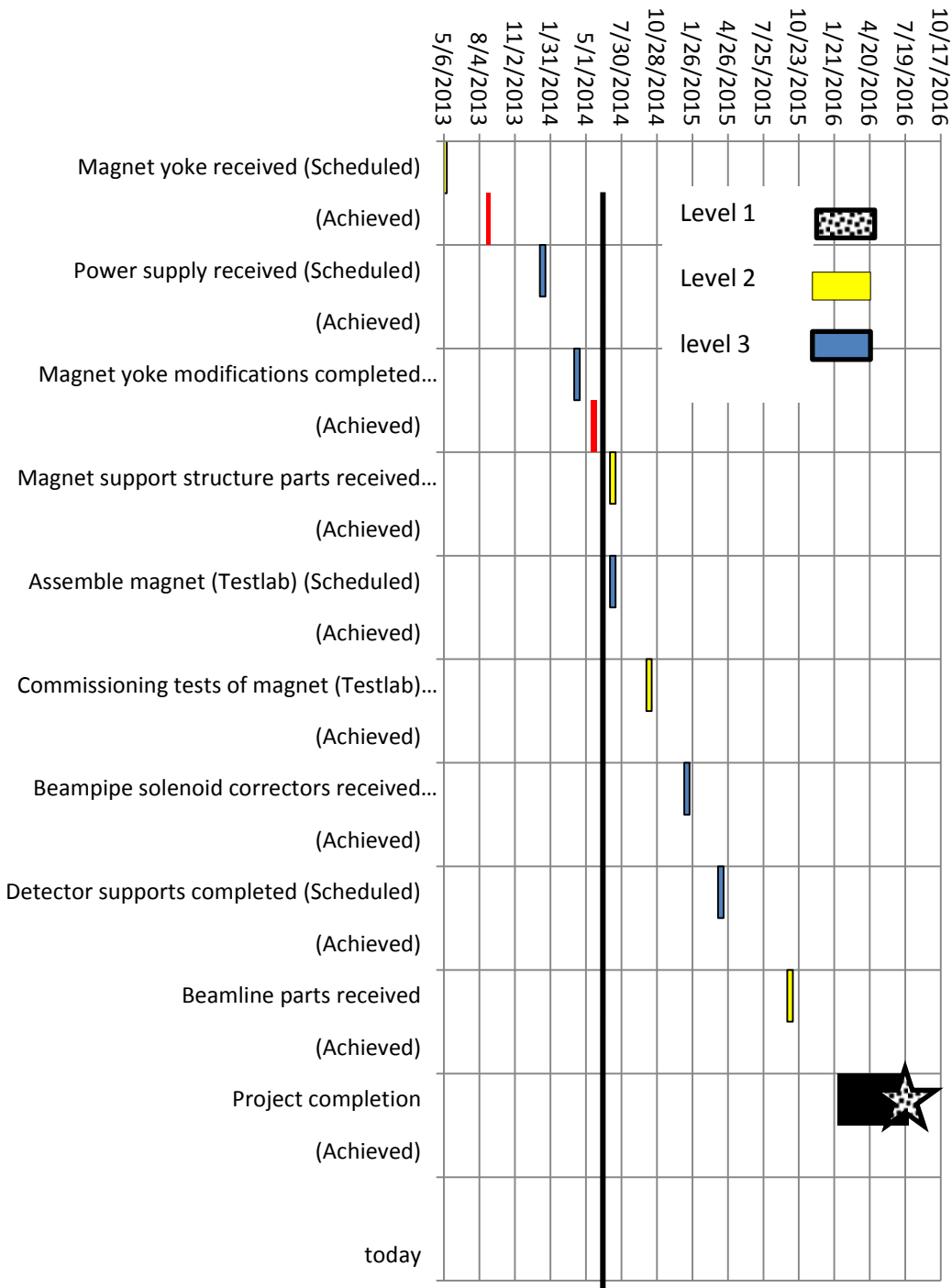
- **WBS 3.01 Milestones:** (see [Appendix 1](#) for a graphic view of the milestones)

Level (ID#)	Milestone	Scheduled Date	Expected date 6/1/2014	Expected date 7/1/2014	Comment
1 (3.1-01M)	Project start	10/1/2012			Completed 10/1/2012
3	Order GEM Parts	10/1/2013			Completed 10/18/2013
3	UVa receives GEM parts	2/3/2014			Completed 4/23/2014
2 (3.2-01M)	First module assembled and tested	3/3/2014			Completed 5/15/2014
2 (3.2-10M)	UVa 5 GEM modules assembled and tested	6/2/2014	8/1/2014	9/1/2014	Shipment of remaining foils By July 18th
2 (3.2-10M)	UVa 6-16 GEM modules assembled and tested	9/30/2014	10/15/2014	3/1/2015	
2 (3.2-30M)	UVa 17-29 GEM modules assembled and tested	3/2/2015	3/2/2015	9/1/2015	
2 (3.2-40M)	UVa 30-40 GEM modules assembled and tested	7/15/2015	7/15/2015	3/1/2016	
2 (3.2-50M)	1 st order of Front End Electronics	10/1/2014	10/1/2014	10/1/2014	
2 (3.2-60M)	2 nd order of Front End Electronics	10/1/2015	10/1/2015	10/1/2015	
1 (3.1-10M)	Project completion	2/1/2017	2/1/2017	2/1/2017	

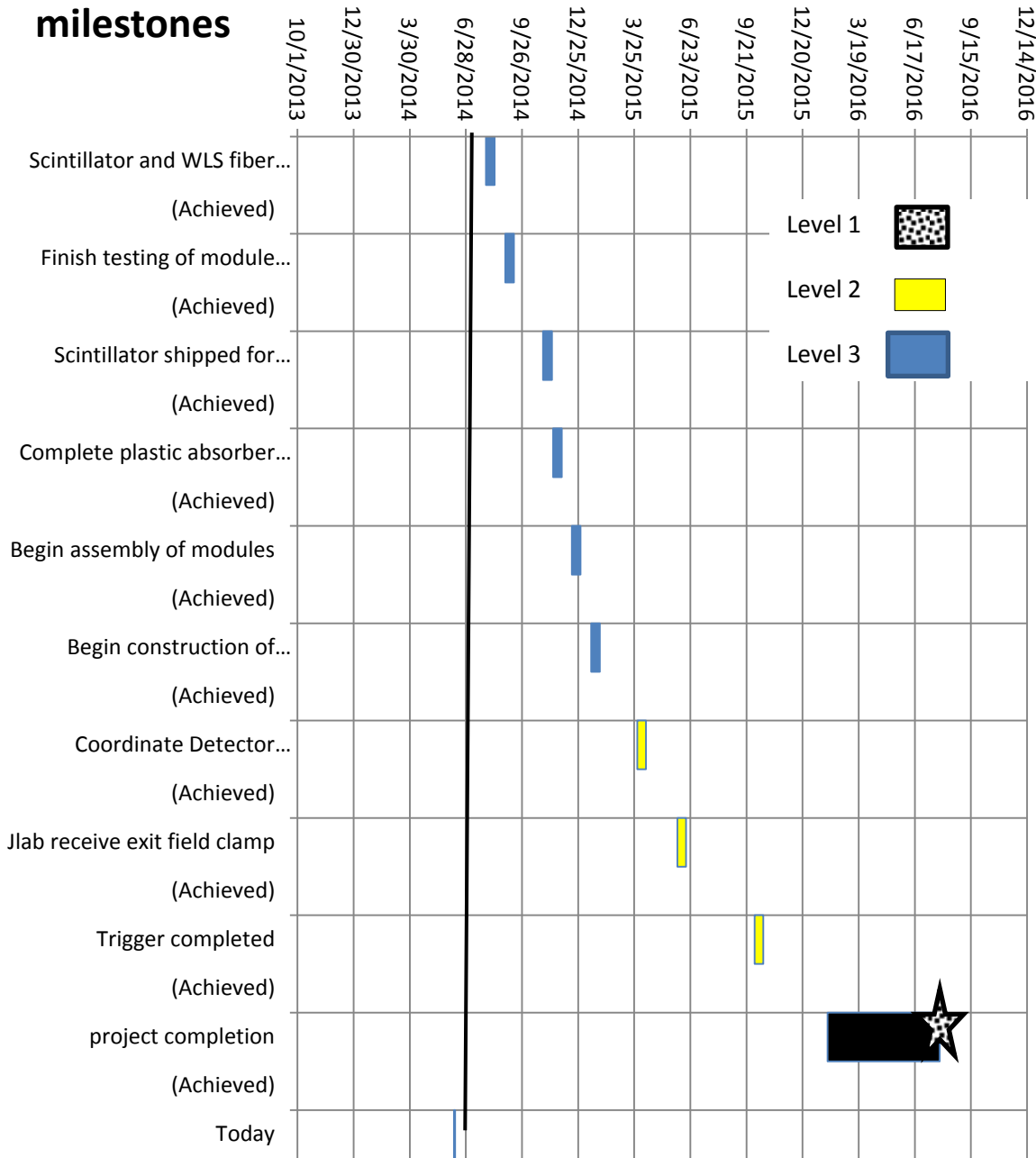
Appendix I

The following are graphical representations of the milestones for SBS Basic (WBS 1), Neutron Form Factor (WBS 2,) and Proton Form Factor (WBS 2), updated on December 1, 2013. Black represents level 1 milestones as specified in the PMP. Yellow represents level 2 milestones from the PMP. Blue represents the new level 3 milestones to allow better quarterly tracking. The black vertical line indicates the day the chart was made. The red bar indicates when the milestone was achieved (e.g. Magnet yoke received).

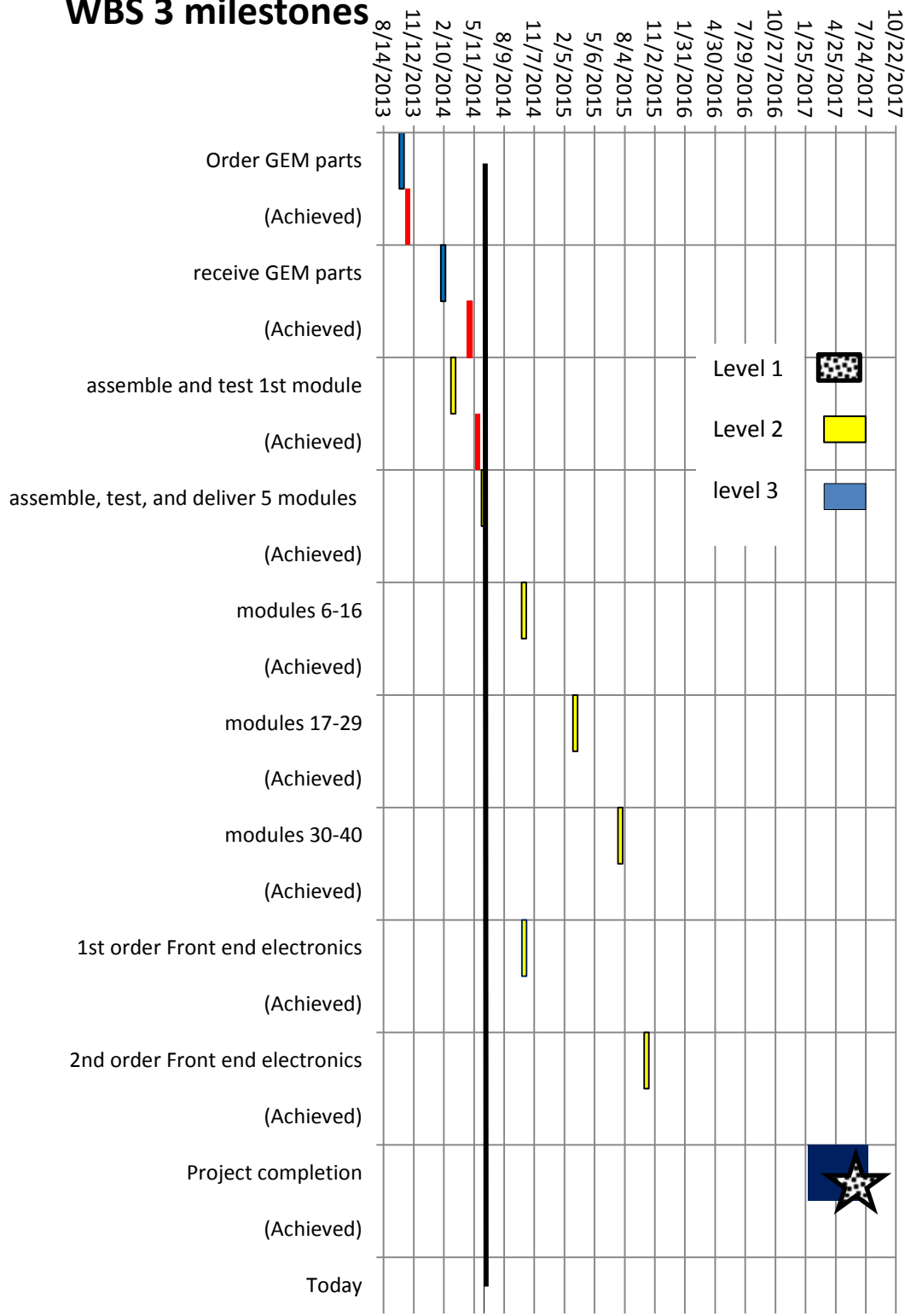
WBS 1 Milestones



WBS 2 milestones



WBS 3 milestones



Appendix II

List of integration milestones for all equipment off-project, as well as key JLab readiness and safety reviews. For each milestone the additional float is indicated.

Polarized ^3He target from UVA (for GEN)

1. Selection of target-cell design for high luminosity: August 2014 (+3 months float)
2. Simulated-beam test (bench test) of selected design: June 2016 (+6 months float)
3. Design for target hardware and instrumentation complete: January 2017 (+6 month float).
4. GEn Polarized ^3He target is ready, June 2017 (+6 months float)

The Gas Cherenkov detector (GRINCH) from W&M (for GMN and GEN)

1. GRINCH detector design complete and components are ordered: August 2014 (+4 months float).
2. GRINCH detector fully assembled and tested for gas and light tightness: January, 2015 (+ 4 months float).
3. GRINCH is installed and tested in the BB detector frame: September 2015(+ 6 months float).
4. GRINCH is ready: September 2016 (+ 4 months float).

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

1. Electronics in production: September 2014
2. Four GEM chambers completed and available at JLab (each chamber has 3 GEM modules): Feb 2016 (+3 months float)
3. Rest of GEM chambers (Two) completed and available at JLab (each chamber has 3 GEM modules): Sep 2016 (+3 months float)

HCal-J from CMU

1. Detailed design completed: June 2014 (+2 months float)
2. Design review: September 2014 (+3 months float)
3. Module construction initiated: October 2014 (+4 months float)
4. Module assembly 50% completed: March, 2016 (+4 months float)
5. Construction is completed: September 2016 (+9 months float)

ECal from JLab

1. Develop concept of annealing: July 2014 (+2 months float)
2. Design review: July 2015(+4 months float)
3. ECAL electronics is ready: May 2016 (+6 months float)
4. ECAL is ready: Sept. 2017 (+9 months float)