**HFT**

**Heavy Flavor Tracker**

MONTHLY REPORT

August 1-31, 2010

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| Performing Organization | Brookhaven Science Associates |
| Location: | Brookhaven National Laboratory |
|  | Upton, New York 11973-5000 |
|  |  |
| Contract Period of Performance | FY2010-FY2014 |

**Brookhaven National Laboratory**

**HFT MONTHLY PROGRESS REPORT**

**August 2010**

**I. Contractor Project Manager’s Assessment**

Technical Progress and Accomplishments

The CD-1 approval was granted on August 31, 2010.

The PXL infrastructure test readout board is well underway. UT Austin has joined the effort for PXL readout. Design work is essentially complete on the mechanical release mechanism for PXL that transfers constraint for the insertion mechanism to the detector kinematic mounts.

Issues and Concerns

The main concerns has been the lack of funding of the design and project planning activities for the project, in particular at LBNL due to the time it has taken to complete the CD-1 process. This has lead to delays in some designs. Proactive steps were taken to ensure Statement of Work, and other required material was in place by end of month.

**II Detailed Status by WBS**

**WBS 1.1 Project Management**

Since the HFT project will start monthly and quarterly reporting following the CD-1 approval, and internal procedure has been setup and documented that will ensure timely input form sub-system, with expected completion of reports on or about the 20th of each month.

The plan, to get to CD2/3 which involves several intermediate meeting and reviews has been put in place. These include:

* Cost and Schedule preparation; in progress.
* HFT internal review of Design, cost and schedule, followed by adjustments. Scheduled for October 14 at BNL.
* BNL lead pre cost and schedule (pre CD2/3) review with external reviewers (around end Nov)
* Finalize documents for CD2/3
* Aim for late January, early February DOE review.

The status and prospects will be evaluated following each step.

The HFT project management has been strengthened with Sarah Morgan in project controls and schedule development in addition to Kerry Mirabella.

Dana Beavis will be sub-system manager for Integration, replacing FV, who was acting sub-system manager.

A project control meeting was held on August 17-18 with people from LBNL and BNL. Several open issues on the development of a bottoms up resource loaded schedule, reporting requirements and account definitions were discussed and agreed upon. Sarah Morgan and the sub-system managers will develop the Cost and Schedule, while the BNL project people will participate in review of these, as well as document development.

Statement of work for HFT activities at LNBL covering the period Sept 1 to Feb 28, 2011 was finalized in anticipation of the CD-1 approval. so funding could flow soon thereafter.

The first monthly telecon with DOE /NP HQ was held on August 12.

Several meetings with the FPD were held in particular to prepare for the ESAAB review.

The ESAAB minutes reported two action items, that will be followed up.

* Ensure that all recommendations resulting from prior reviews have been appropriately responded too and that there is general agreement by all parties.
* Revise the Project Execution Plan (PEP) to be a more concise document—the preliminary PEP is still too detailed.

**WBS 1.2 PXL detector**

The infrastructure Test Board (ITB) testing is under way. The first results of these investigations are coming in and the issues found will be discussed with IPHC in person in September.

Jo Schambach from the University of Texas at Austin visited LBNL for a week in order to learn the hardware, firmware and software environment for the PXL RDO system. Good progress was made. All of the system firmware and software is now checked into a subversion server at UTA and in a structure that will be useful for multi-site RDO development. He has returned to UTA with a working RDO system and will be now actively doing development as part of the PXL team.

The UTA will take primary responsibility for beam testing the thinned Phase-2 sensors and will fabricate the mechanical holding box and trigger scintillators. LBNL will provide all of the sensor and RDO hardware. UTA will make the required modifications to the RDO firmware and software needed for telescope readout.

The PXL group has contacted Aptek to understand the unexpectedly low yield of 64% total in the pre-scribe thinning method. The process notes indicated that our wafer separated from the adhesive earlier than expected in the process probably leading to the poor yield. This is not typical and while they cannot explain this particular case, we can expect a > 90% yield with the prescribe process. We expect to send them another wafer for processing.

Mechanical prototype pieces for the insertion mechanism and for the metrology of sectors are under fabrication both at LBNL and UTA shops. Also, work is progressing in the shops on fabricating fixtures required for prototyping with a number of pieces completed. These fixtures will then be used again later in building final structures. Design work is essentially complete on the mechanical release mechanism that transfers constraint for the insertion mechanism to the detector kinematic mounts. Design updates of the PXL storage and transfer box is progressing. These updates will make the transfer box compatible with recent developments in the insertion mechanism design.

**WBS 1.3 IST detector**

The IST hybrid design made some progress in August. For many reasons it is easier to have one large hybrid, with 6 sensors, per ladder, rather than the 3 hybrids per ladder. The 3 hybrids would have to be assembled into 3 modules with carbon fiber back plates and then glued to the ladders. Prototyping of these modules showed excessive bowing because of the incompatibility of the materials that need to be used. The 1 hybrid per ladder design will have the hybrid directly laminated to the carbon fiber ladder during the ladder production phase. The stiffness of the honeycomb ladder will greatly reduce bowing of the assembly. The design of this 1 big hybrid is currently ongoing. Some information with respect to currents in the

pre-prototypes is still needed to properly dimension the traces on the hybrid. Since there will be only 1 Kapton readout cable per ladder with the new design, the thickness and width of the traces has to be tweaked.

This could lead to a slight increase of the width of the cable and of the ladder itself. Having only 1 signal connector per ladder, instead of 3, will make the support mechanics and electrically debugging much easier.

The hybrid production company has already confirmed their ability of making this new large Kapton hybrid+cable. The lamination process of this hybrid with a honeycomb carbon fiber ladder will be prototyped at LBNL in the coming months.

The pre-prototype module that was fully bonded at the Instrumentation Division at BNL is currently being tested. The firmware code to run the APV25-S1 readout chips in calibration mode will be finished in the coming week. This code is needed to determine the operational settings of the APV chips, which makes it possible to measure to operational currents. These operational values are needed for the design of the traces on the new large hybrid.

**WBS 1.4 SSD detector**

Ladder Board

Engineering resources at Nantes for the ladder board have been devoted to another project. These resources should be available to finish the design of the ladder prototype board in September. Procurement of components for the prototype ladder board is in progress.

SSD Readout board (RDO)

Work was carried out on defining and implementing the functionality in the Slave FPGA that manages the configuration of the ladder board FPGA via the optical fiber. It was decided to acquire the configuration data from Slow Controls via VME, and to store these data in a small serial PROM associated with each Slave FPGA.

Code has been written to carry out these functions, and is now in the process of verification via simulation. This code represents the last functional blocks remaining to be implemented for the Slave FPGA; the Slave FPGA code is approximately 95% complete.

No progress has been made on the code development for the remaining FPGAs (Master and VME) on the RDO board. This work will start after the prototype ladder board is submitted.

Cabling

A draft document for the design of the cable on the OSC (Outer Support Cylinder has been circulated for comment. Components for the cable have been ordered. A sample cable will be built with a sample from the FGT. The FGT cable has more conductors than needed and has different insulation. Nevertheless, it will serve as a model for the cable design.

**WBS 1.5 Integration**

Clean Room

Discussion has begun on the subsystems needs for the clean room area for detector assembly. Gerrit van Nieuwenhuizen and Dana Beavis met to discuss the FGT needs. The plan is that FGT and HFT will meet in Sept. with STAR operations and develop a plan for improvements for the clean room. The FGT needs the area by Jan. 2011. A specification for the improvements will be generated. For HFT the area may not be sufficient for full assembly and testing of the detectors. This will be examined more closely in the future.

Some of the expected improvements are:

1. Empty room and clean thoroughly.
2. Add air conditioning with flow considerations.
3. Step off area at the single door with plastic “drapes” to serve as the entrance
4. Trigger and DAQ fibers to the room.
5. Options for air systems outside the clean room.
6. Determine if the roof can be accessed while the room is in use.
7. Power requirements for 208V.

Rack space in IR

SSD intends to use existing rack space that it has.

IST has provided a list and tentative location of racks.

PXL has information in e-room from Leo Greiner. PXL needs a half rack near pole tip and the location needs to be agreed on.

The rack space in the IR has not been assigned to HFT for any of the subsystems. Ciro D’Agostino, BNL has a database for the rack assignments. A meeting will be held in Sept. to assign rack space for the HFT. The database will then be updated.

Beam Pipe

A mechanical engineer is needed to conduct the analysis of the beam pipe. John S. could start the drawing for the assemblies. Also the engineering and design for the change for the east wall support could begin. The LBNL mechanical engineer, Eric Anderssen will be at CERN Nov. 10 and could handle some issues related to the beam pipe such as the integrated heating blankets.

IR general

The CA-D Liaison Engineer noted that often they get requests for ports in shield walls but find ways to snake things into the area. Howard Wieman has provided dimensions of the PXL box that needs to move in/out of the IR. John Scheblein , STAR ops, has provided the layout print that depicts the shielding placement at the back of the IR when the shield wall comes down. If a shadow wall is added it most likely will be on the outside and probably stored outside. Discussion has started with STAR operations on the use of the assembly hall areas for the HFT final assembly. Jason Bessuille, MIT, has been adding detectors and shielding to the model of the IR. At some point it would be good to compare the model to what is there.

IDS

The MSC and its tooling have been loaded into Adept. Quotes for the West Support Cylinder (WSC) and the Outer Support Cylinder (OSC) have been received from Allied Engineering and are within expectations. A final pass at the design to account for thermal expansion will be conducted before the contracts are awarded.

MSC and PXL Support

UTA has starting fabrication of some of the bonding jigs for the MSC Pixel Insertion Tube (PIT). This effort is shared with Pixel mechanics.

Safety

Sign-off on the fire issues related to the carbon fiber structures is still open.

**WBS 1.6 Software**

The schedule for the offline software activities is being prepared, and a number of simulation activities that will support the physics mission of the project are underway.

Physics simulations

* High-z radiation GEANT simulation (Purdue). This work is basically done and a note will be prepared
* HFT+MTD production ( LBL) for B->J/Psi->muons studies is done and the initial QA was done and presented about a week ago in an MTD meeting.
* The Ds work has resumed at UCLA with the help of a graduate student.

**Financial Status**

Project funds until CD1 approval have been the R&D funds allocated to LBNL in April 2010. This being the first monthly report only those funds are shown, as they have been fully spend by end of August. The distributions of cost at completion on other WBS items are to be determined at base lining.

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| **WBS** | **Title** | **Monthly Actual** | **FY to Date** | **Project to Date****k$** | **Commitments****K$** | **Cost at Completion****K$** |
| 1.1 | Management |   |   |   |   |   |
| 1.2 | PXL |   |   |   |   |   |
| 1.3 | IST |   |   |   |   |   |
| 1.4 | SSD |   |   |   |   |   |
| 1.5 | Integration |  |  |  |  |  |
| 1.6 | Software |   |   |   |   |   |
|   | R&D |   |   | 280 |   | 280 |
|   | Contingency |   |   |   |   |   |
|   | Total | 0 | 0 | 280 | 0 |   |