DOE Recommendations with BNL Responses

A Department of Energy Annual Progress Review of the Electron Beam Ion Source (EBIS) Project was held at BNL on May 14-15, 2006. The final report was received on July 25, 2006. The many insightful comments and suggestions made both in the written report and during discussions at the review will be very useful to the EBIS Project. Many of these comments have been incorporated in to the project documents, others have led to improvements in the project schedule or refinements in physics and engineering approach, etc. The EBIS Project Team is very appreciative of the time and effort put in to this review by the Review Committee.

The following are the recommendations from the review, followed by specific comments by the EBIS Project Team addressing these recommendations:

- **Prior to Critical Decision-2 (CD-2), revise the Startup Plan to incorporate comments made at the review, as well as task duration and integration.**

  - Comments (modifying the sequence of some tests, the use of He 1+, etc.), task durations, and integration have been addressed and incorporated into the EBIS Startup Plan. The plan was then sent to DOE-NP, and their final additional comments were incorporated in the present version. This action is complete.

- **Prior to CD-2, re-evaluate the Systems Requirement document for consistency in parameter definition.**

  - The inconsistent emittance units have been corrected within the Systems Requirement document. The new version was sent to DOE-NP and accepted without any further changes. This action is complete.

- **End-to-end beam dynamics simulations of the LEBT-RFQ-MEBT-Linac systems, including all known types of errors, should be completed prior to completion of final design.**

  - At the May review, complete end to end simulations were presented, as a follow-up to a comment from the 2005 Review. Error studies had been done and were also presented at the May review – including studies of RFQ phase and amplitude errors; buncher phase and amplitude errors; MEBT, Linac, and HEBT quad strength errors; IH linac phase and amplitude errors; HEBT quad alignment errors. Based on these calculations, we feel we have a good understanding of the effects of likely errors, and feel that the end-to-end simulations without errors provide us with a sufficient level of confidence in the soundness of the overall design of the RFQ, Linac, and matching beamlines.

The actual RFQ and Linac are procurements which include the final physics design, so we have reservations about devoting too many resources in to doing more detailed error studies at this time, since they won't be with actual structures.

We are confident that normal errors arising from the fabrication process for the RFQ and linac are acceptable, based on previously fabricated very similar RFQ and IH structures, where the as-built devices performed as calculated. However, we will continue to do the simulations and error studies as an iterative process as the RFQ and Linac physics design progresses, within the limits of the available codes. (The calculation of the effect of errors in the Linac requires that either we invest considerable time to attempt to modify the beam dynamics code developed at GSI and Frankfurt, or get Frankfurt to modify the code. This will be investigated.)

- **Develop a detailed Quality Assurance (QA) Plan for the fabrication and testing of the Radio Frequency Quadrupole (RFQ) and include it in the final vendor contract.**

➢ As noted in the BNL response to the Draft Bullets, this item required no action. The Specification for the RFQ referenced BNL-QA-101, which exists as a free standing reference document. Specific clauses cited in the specification include the following: RFQ manufacturer must be certified ISO 9001; Configuration control system; Manufacturing/inspection/test plan; Witness points; Test and Inspection procedures; documentation packages; certificate of conformance; notification of changes to design, methods, or processes. (Some additions were made to the RFQ Specification based on suggestions from committee members during the review). This action is complete.

- **Prior to CD-2, integrate low level RF design efforts supported outside the project scope and design reviews into the project schedule.**

➢ Deadline schedule dates for the low level RF design efforts have been added to the EBIS Project schedule. This action is complete.

- **Perform a critical path analysis, based on a first Quarter Fiscal Year 2010 (1QFY10) project completion, prior to CD-2 and incorporate results into project planning and documentation.**

➢ A critical path analysis was performed and incorporated into Project planning and documentation. The analysis accommodates the NASA preferred 1QFY10 completion with its Early Finish dates, but leaves the CD-4 date as 2QFY10. NASA is in agreement with this approach. This action is complete.

- **Compare the obligations profile to the funding profile. Re-assess the contingency analysis upon completion of the critical path analysis and refinement of risk assessment. Optimize the contingency profile with respect to the planned obligation profile.**

- Risk and Contingency were reassessed before performing a review of funding vs. planned obligations by fiscal year. The results have been discussed with Federal Project Director Mike Butler as manager of the EBIS contingency funds. This action is complete.

• **Review and adjust, as necessary, the Level 2 and 3 milestones to ensure that progress can be adequately evaluated.**

- Additional milestones and deadline dates have been added to the schedule. This action is complete.

• **Appoint an Integration Manager to the project team.**

- An Integration manager has been appointed to the team and added to the organization chart. The roles and responsibilities for the Integration Manager were added to the Project Execution Plan. This action is complete.

• **The risk assessment should be re-evaluated upon the completion of a critical path analysis and to incorporate feedback from this review. This should occur prior to CD-2 and the results incorporated into project planning and documentation**.

- Risks have been reassessed and results incorporated into the Project schedule and documentation. Reassessment of risks, tracking closely high risk items, and continuous development of mitigation plans, will be ongoing throughout the project. This action is complete.