Charge
Director's Independent Design and CD-2/3 Review of the Muon g-2 Project
June 17-19, 2014

The Committee is to conduct a Director's Independent Design and CD-2/3 Review of the Muon g-2 Project to assess if the Project meets the Critical Decision (CD) 2/3 (CD-2, Approval of Performance Baseline and CD-3, Approval to Start Construction) requirements as specified in DOE O 413.3B. The Muon g-2 Project received CD-1 approval on December 19, 2013. The Project is scheduled for a DOE CD-2/3 Review on July 29-31, 2014.

The Muon g-2 Project will construct a next generation experiment to measure the anomalous magnetic moment of the muon to an unprecedented level of precision, reducing the experimental error by a factor of 4 or 5 relative to the Brookhaven Muon g-2 experiment, E821. If the anomaly measured at BNL persists, this reduction in the experimental error will push the difference with theory to > 5 sigma, a clear signal of new physics. The Muon g-2 Project will reuse the storage ring and much associated equipment along with beam elements from the Brookhaven experiment. The reassembly of the g-2 equipment in the new Muon Campus area being developed at Fermilab will begin in January 2014. Reassembly of the device requires careful attention to detail in order to produce the sub-ppm magnetic field uniformity required for the experiment. Beyond reassembly of the experiment, a number of upgrades are planned to enhance the injection efficiency into the storage ring, operate at higher repetition rates, and better control systematics. Upgraded subsystems include electromagnetic kickers, electrostatic quadrupoles, field-monitoring NMR subsystems, and possibly a new superconducting inflector. New particle detectors based on PbF2 calorimetry and in vacuo straw trackers will be constructed for the experiment. Beyond the storage ring and associated subsystems, the Project will include modifications to portions of the anti-proton source to deliver a customized muon beam. The Project also depends on elements provided by the Muon Campus AIP and GPP initiatives that are common to Muon g-2 and Mu2e needs.

The review committee will assess the level of maturity of the Project's design. To meet the requirements for CD-2 the design has to be at the preliminary level or greater, and for CD-3 the design has to be at the level of final or near final design. The committee will make their assessment based on the Muon g-2 Project's Technical Design Report (TDR), drawings, specifications, and discussions with the Project team.

In addition, the review committee will focus on Project's CD-2/3 readiness including assessing the technical scope as well as the cost, schedule and management areas. The technical scope of this review includes an assessment of the status of the Muon g-2 final design work. The committee will evaluate the current schedule, taking risks into consideration, and determine if the Project's scope of work can be accomplished within the approved Total Project Cost (TPC) by the CD-4 date. The committee is to assess if the Project team is in place to implement full construction while providing monthly statusing progress reports to DOE and Lab Management on cost/schedule against the Project Plan. The committee will also assess and confirm that ESH&Q has been adequately addressed.

A DOE CD-1 Review of the Muon g-2 Project was conducted on September 17-18, 2013, which resulted in CD-1 Approval. In addition, a Director's Independent Conceptual Design Review was conducted on June 5-7, 2013, determined that the Project's integration of past experience on g-2, coupled with its considerable efforts related to design improvements and optimization, have resulted in a well-developed design. The Independent Conceptual Design Review resulted in eight recommendations. The Committee is to assess the Project's progress on addressing the recommendations from these prior Reviews.

The review committee is asked to address the following questions to assess the Project's progress:

1. Is the Project's design appropriately developed and well documented in their Technical Design Report (TDR)? Does the design satisfy the Project's performance requirements to carry out the scientific mission? Is the final design sufficiently mature so that the Project can initiate procurements and start construction? For those elements of the design that are still not finalized, has the Project shown that there are no major issues that need to be addressed and that they are on a clear path to a final design?
2. Has the Project developed a resource loaded schedule that includes the Project's scope of work and is achievable?
3. Does the Project have credible cost and schedule estimates? Do they include adequate scope, cost and schedule contingency?
4. Has the Project documented the Basis of Estimate (BOE) that supports the baseline cost and schedule presented?
5. Is the scope of work clearly defined between what is funded by DOE or NSF, and is this reflected in the cost, schedule and risk assessment presented to the committee?
6. Has the Project implemented Risk Management by identifying risks, performing a risk assessment (qualitative and quantitative) and developing mitigation plans?
7. Is CD-4 achievable with the Project's risks and within the DOE approved Total Project Cost?
8. Has the Project updated required project management documents per DOE Order 413.3B for CD-2/3 and per the Fermilab Project Management System?
9. Are the Project organization and staffing levels adequate to manage the work to get to CD-4?
10. Are the ESH&Q aspects being properly addressed?
11. Does the Project's process for monthly statusing and reporting satisfy DOE and Laboratory requirements?
12. Has the Project properly addressed the recommendations from the DOE CD-1 Review, the Director's CD-1 Review and the Independent Conceptual Design Review?
13. Is the Muon g-2 Project ready for a DOE CD-2/3 review in July?

Finally, the committee should present answers to the above questions and present findings, comments, and recommendations at a closeout meeting with the Muon g-2 Project and Fermilab management. A written report will be provided within two weeks after the review.

Approval:

Nigel Lockyer, Director of Fermilab Date