Fermilab Accelerator Advisory Committee Meeting

Charge

December 8-10, 2015

Fermilab's goal is to deliver the highest power neutrino beams in the world. To this end, the number of protons delivered for the production of our neutrino beams must be increased to the NOvA experiment in the near term and to LBNF in the longer term. The goal of the Proton Improvement Plan (PIP) is to enable proton beams in support of 15 Hz Booster operations and to provide the proton flux sufficient of up to 700 kW to the NOvA target. The goal of PIP-II is to deliver proton beams of 1.2 MW to the LBNF target. PIP-II will replace the existing Linac and must interface with the Booster after the PIP upgrades are completed. Additional upgrades to the Booster and Main Injector are be required to realize the 1.2 MW goal. Fermilab is also collaborating in the production of Superconducting RF (SRF) accelerating modules and the cryogenic distribution system for LCLS-II. This task relies on the Fermilab expertise and experience in SRF and cryogenics and may present a production challenge for PIP-II modules.

The delivery of multi-MW beams for the future program will require additional upgrades beyond PIP-II such as the replacement of the Booster, and R&D, for example, in high power targets. These preliminary ideas may be described as PIP-III.

It is planned to commission the Muon Campus facilities, providing muon beams to the Muon g-2 experiment in 2017 and later to the Mu2e experiment.

Finally, we request your consideration of the R&D activities for FAST, IOTA, SRF, and High Field Magnets.

The Fermilab Accelerator Advisory Committee is asked to assess and provide advice on the following topics with a concentration on the accelerator physics and engineering:

1. Have the recommendations from AAC2014 been adequately addressed?

2. Is the goal of 700 kW on target by mid-2016 technically achievable?

3. Are the plans in place to overcome beam instabilities and losses in the Recycler during slip-sacking adequate? (presentations from the Recycler Instability task force and the Loss mitigation task force)

4. Are the MI/RR beam losses understood sufficiently to minimize machine and tunnel activation? (the Loss Mitigation task force)

5. Evaluate progress of the Proton Improvement Plan (PIP). Are the plans to increase the beam flux in the Booster adequate and the associated accelerator physics understood?

6. Are the plans for new Booster cavities appropriate for future Booster upgrades, to serve at least through PIP-II and potentially through PIP-III? (see report on Cavity Upgrade review).

7. Evaluate the plan for commissioning and operations of the Muon Campus accelerator systems. Is the plan sound?

8. Is the plan and the organization for the LCLS-II cryomodule production and testing sound?

9. The PIP-II R&D program and the cryoplant design effort are being jointly executed with India. Evaluate these joint plans and comment on the split between Fermilab and India. Is the split appropriate and is the effort likely to reduce the project risk and/or costs?

10. Are the plans for the first experiments at FAST and IOTA appropriate? Is the organization of this Fermilab effort sound and appropriate?

11. Evaluate the program for development of high power target systems. Are the activities likely to result in a conceptual design of a multi-megawatt target in time for PIP-II/DUNE.

12. Evaluate the Fermilab High-field magnet program: Is it sound and aligned well with the P5 recommendation to "continue to play a leadership role in superconducting magnet technology focused on the dual goals of increasing performance and decreasing costs" for present and future hadron colliders (e.g. LHC upgrades)? Are the allocated resources adequate for the proposed plan and schedule?

13. Evaluate the SRF science and technology program: Is the plan sound? Does it address all major SRF-related issues relevant to future HEP Intensity-Frontier CW linacs at Fermilab? How well is it aligned with needs of future HEP Energy-Frontier machines?

14. Comment on Fermilab's analysis of the proton beam power options beyond the PIP-II goal of 1.2 MW and on the possible R&D scope for these options.

The Fermilab Director would welcome any other comments the AAC has on any of the topics presented, or on other issues beyond the topics presented.

In addition to a verbal closeout with the management of the Accelerator and Technical Divisions on the final day of the meeting, the AAC is requested to submit a written report of their findings, comments, and recommendations to Sergei Nagaitsev by February 1, 2016.