Report of the Fourth Meeting of the Fermilab Testbeam Committee

December 3, 2016

1 Introduction

This is a report of the fourth Fermilab Testbeam Committee meeting held on October 25, 2016, at Fermilab. The Fermilab Testbeam Facility (FTBF) is a valuable resource for the HEP community. It provides a US-based facility for developing new detectors, which is used by many in the HEP community, including parties not otherwise heavily represented at FNAL (e.g., ATLAS and PHENIX collaborations.) Overall, the goal of the committee is to give advice to the Fermilab Directorate on how to optimize the impact of the facility and its use. The charge for the meeting is presented in the Appendix.

2 Summary of the meeting

The agenda of the meeting can be found in Appendix A.

Dr. Rominsky, leader of the FTBF group, presented a review of the past year's activities and the progress made towards implementing the recommendations made in last year's meeting. In addition to the review, the FY16 annual report was made available to the committee for review.

The facility continues to serve a very large and diverse set of users. Flexibility by the users and by the staff has allowed the MTEST facility to be used by more than one user every week that beam was available. No users were turned away. Additional groups can be accommodated by 24-hour running.

The annual report shows an impressive list of technical work being done with the FTBF beamline. 16 different test experiments were performed in FY16, including HL-LHC studies, sPHENIX, development for g-2, mu2e, generic R&D for future experiments, and LArIAT. FTBF hosted 261 users, mainly scientists but also a significant fraction of post-docs and students. Ten papers were published during this period based on test experiments performed at the FTBF.

Progress on creating an integrated DAQ was presented. The MIDAS platform was adopted. A Si telescope, developed by the CMS group, can be used as-needed by FTBF users, though intervention by CMS collaborators is still required. The FTBF staff developed a novel "virtual machine" for distribution to users to simplify the interaction with Fermilab computing resources. The committee commends the staff for making a lot of progress on this important goal of simplifying how users get their data.

The process for approvals at the lab (TSW and ORC) has also been streamlined. While the number of signatures required has not been reduced, the process is now electronic

and the amount of paperwork is now more commensurate with the size of the project. The FTBF staff has also implemented a "pre-ORC" checklist to ensure that the walk-through with the ORC staff goes smoothly. The committee is happy with the progress in streamlining the approval process.

The FTBF full-time staff has been significantly reduced by retirements and people being moved to other projects. Remaining staff members do not have good overlap in skill sets, leaving the facility in a state where they may have "single point failureâĂİ if one of the remaining members is out sick. Based on the past fiscal year, 6.4 FTEs are charged to the FTBF facility. Of these roughly 3.5 FTEs are permanently assigned (this number has been reduced by about 1 FTE from past years.) The rest of the FTEs are either short-term helpers to the facility for repairs or ongoing facility maintenance. While the overall staffing level appears to be enough to keep the facility going at current level, it appears that additional dedicated FTEs for the facility will be required to continue to improve the facility as per user needs.

NOvA has expressed interest in using the tertiary beam in MCenter at the MC7 enclosure. Test beam data will help the NOvA collaboration characterize detector response to hadronic particles. These are key input to the flagship muon neutrino disappearance and electron neutrino appearance oscillation measurements for this experiment. Work removing MIPP components to clear the enclosure has already been done. Other required improvements to the facility were described as generally useful for the FTBF. The committee commends the work being done towards enabling these measurements and improvements to the facility.

In addition to the material presented by the staff, the committee received letters of support from the US-CMS collaboration, the mu2e collaboration, and the PHENIX collaboration. The FTBF is "essential for the first stages [of the CMS HGCAL program] and will be very important for [CMS] in the immediate and long-term future," according to CMS collaborators Jim Freeman, Roger Rusack ad Dave Barney. Additionally, "the results of [tests at the FTBF] will be essential for the [CMS HGCAL] Technical Design Report that [CMS] will submit to the LHCC in late 2017." The PHENIX letter, by Joh Haggerty, Eric Mannel, and Craig Woody, of BNL, states that PHENIX "... will continue to rely on the availability of test beams at FTBF to test our prototype detectors."

A common theme in the more detailed letters requested that the lab dedicate resource to improve the quality of the FTBF beams. Specifically, improving the beams by reducing momentum spread, a reduction of up-stream material, and increased purity of electron beams were mentioned. It is important to understand the needs of a wide swath of the user community, so that these requests can be addressed and incorporated into the future plans of the facility. A plan for achieving these improvements should be developed.

3 Recommendations

Below please find a list of recommendations generated by the annual report and the meeting.

- Prepare and plan for a spike in requests at the FTBF during the next long CERN shutdown. The period during 2019/2020 will be crucial for the LHC HL-LHC upgrades, and a time where the CERN facility will be unavailable.

  - Develop criteria ahead of time to deal with the expected increase of requests and deal with possible over-subscription
  - Ask the large experiments (CMS, ATLAS, mu2e, PHENIX) to bundle their requests with prioritization to ensure that the received beam time is in line with the priorities of the experiments.

- Formalize the procedure for getting credit for the FTBF in papers and conference with FNAL PUB numbers.

- Consider increasing dedicated FTBF labor

  - Augment the FTBF staff with another physicist for six months
  - lab should provide labor not "as needed" but dedicated to facility. "As needed" allows facility to run but prevents any improvements to be done.

- Continue to work on the characterization of the beam, and understand from user community if the purity and resolution of the beam is adequate for user needs

- Start tracking user needs for the "proton tax" discussion that will occur in the future. For instance, are users sensitive to total number of protons or beam time? How would "proton tax" changes be implemented?

- Continue to focus on the MIDAS platform and integrate the Si telescope into this platform.

- Consider increasing the M&S budget for smoother running of the facility, and include both ongoing maintenance and future upgrades in this budget

  - M&S items to be motivated by identified user needs and prioritized to allow the lab to have an orderly upgrade path
  - Requests for upgrades should clearly indicate how they will benefit the user community
  - When considering upgrades, (labor) costs associated with the installation must be considered

- FNAL management should consider defining its Accelerator Safety Envelope such that routine FTBF activities do not constitute a change of this document

4 Summary

The Fermilab Testbeam Committee thanks the staff for putting together the annual report and the useful presentation, and commends them to continue to operate the FTBF successfully in light of tight budget and manpower constraints. Much progress has been made since the last meeting towards getting understanding of the facility and working towards its future. The test beam continues to be an important resource for HEP, and will be increasingly so during the lead-in to the LHC upgrades, when the CERN facility is shut down. Much credit must be given to Dr. Rominsky and her team for running the test beam.

We look forward to our next meeting.

A Agenda of the meeting

The agenda can be seen at this URL:

`https://indico.fnal.gov/conferenceDisplay.py?confId=13161`,

and is copied below for the record.

Time	Length	Title	Speaker
9:00 AM	15m	Executive Session	
9:15 AM	10m	Progress on recommendations from previous meeting	M. Rominsky
9:25 AM	10m	Discussion	All
9:35 AM	40m	Annual FTBF Report for 2016, FY17 Plans	M. Rominsky
10:15 AM	10m	Discussion	All
10:25 AM	15m	Break	
10:40 AM	30m	Community input and discussion	
11:10 PM	50m	Executive Session	
12:00 PM	30m	Closeout	

B Committee Membership

- Carsten Hast, SLAC
- Ron Lipton, FNAL
- Jen Raaf, FNAL
- Mayly Sanchez, Iowa State/ANL
- Guy Savard, ANL
- Mandy Rominsky, FNAL (*ex-officio*)
- Henric Wilkens, CERN
- Peter Wittich, Cornell (chair)

Additionally, the meeting was attended by the following Fermilab employees.

- JJ Schmidt
- Pushpa Bhat
- Stephen Geer

This was a phone meeting; most of the committee attended remotely.

C Charge for the meeting

The testbeam facilities at Fermilab are a valuable resource for the HEP community. The committee is asked to give advice to the Fermilab Directorate on the operation and development of the Fermilab Testbeam Facility (FTBF), and on any programmatic choices needed to optimize its use and scientific impact.

In particular, at the present meeting the committee is asked to comment on:

1. The community usage and the scientific impact of the FY16 FTBF program, as documented in the annual FTBF report.

2. The plan for the FY17 FTBF program, facilities and resources, as presented at this meeting, and the value of the FTBF program to the HEP user community going forward.

3. Progress made by the test beam operations team and the Lab in following-up on the committee's recommendations from the previous meeting held in November 2015.

The Directorate will welcome any other comments from the committee about utilization of the facility, the need for programmatic choices, and the need for facility enhancements.

The committee is asked to deliver a short written report to the Office of Program Planning by November 4, 2015.