Physics Advisory Committee
January 22-24, 2014

CHARGE

After a 16 month shutdown, the Fermilab accelerator complex has restarted operations with a suite of experiments (MINERvA, MINOS+, a growing NOvA detector, SeaQuest, and a program of testbeam experiments). Towards the end of FY14, this accelerator-based program will be enhanced with the addition of MicroBooNE and a completed NOvA detector. The longer-term accelerator-based program includes g-2, and eventually Mu2e and LBNE. In addition, Stage-1 approval has previously been granted to ORKA, NuSTORM and, contingent upon developing a funding plan, further SeaQuest running with a polarized target (and with less priority, with a polarized beam).

In parallel with hosting the domestic accelerator-based program, the laboratory plays a critical role in supporting U.S. contributions to the CMS experiment. In addition, the laboratory gives crucial support to a suite of Cosmic Frontier experiments, including playing a leading role in DES, which has just begun it's 5 year survey, and in developing the next generation of dark energy and dark matter experiments.

At this meeting the PAC will hear updates on the post-shutdown state of the accelerator complex, and on MicroBooNE, NOvA, LBNE, g-2, and Mu2e. In addition, there are five Proposals and one EOI to consider for the accelerator-based program, and a request for a period of special running for the MINERvA experiment. Finally, the PAC will have an update on the status of DES, and will hear about the possible role of the laboratory in the next generation of CMB measurements.

1. New Initiatives

EOI: The Atmospheric Neutrino Neutron Interaction Experiment (ANNIE)
R&D PROPOSAL P-1051: Cherenkov detectors In mine PitS (CHIPS) R&D
PROPOSAL P-1032: A Proposal to Search for Dark Matter with MiniBooNE
PROPOSAL P-1033: A Proposal for MiniBooNE+
PROPOSAL P-1052: ICARUS at Fermilab
PROPOSAL P-1053: LAr1-ND: Testing Neutrino Anomalies with Multiple LAr TPC Detectors

Given the uncertainty in funding, we ask the PAC to comment and make its recommendations separately under assumptions of (1) no budgetary issues and (2) if the Fermilab budget is severely constrained over the next few years. For the four full proposals, we ask the PAC to make recommendations and to comment specifically on the following issues:

1. Is the science in the proposal interesting and/or compelling?
2. Is the technique proposed appropriate for, and likely to be capable of reaching the physics goals of the experiment?
3. What is the competition for reaching the physics goals of the proposed experiment? Does the proposed experiment have particular advantages or disadvantages relative to the competition?
4. What is needed to make such an experiment successful?

For the EOI and the R&D proposal, we ask the PAC to comment on whether the science goals are compelling, and the scope and appropriateness of the support requested.

2. Liquid Argon detector initiatives

Two of the proposals (1052 and 1053) are for short-baseline neutrino experiments using liquid Argon detectors. They could potentially enhance the short-baseline program at Fermilab that starts with MicroBooNE. We ask the PAC to comment specifically on the following:

1. To what extent would 1052 and/or 1053 enhance and complement the science reach of MicroBooNE? To what extent do 1052 and 1053 complement each other? Would the addition of these experiments result in a coherent short-baseline program at the laboratory?
2. To what extent would the addition of 1052 and/or 1053 to MicroBooNE and LBNE result in an overall liquid argon based neutrino program at Fermilab that is coherent?

3. MINERvA special running request

The MINERvA Collaboration is requesting several weeks of special running to better understand the NuMI beam, and therefore reduce the systematic uncertainties on their measurements. We ask the PAC to comment on (i) whether there is a compelling science case for the proposed incremental improvements in the measurements, and (ii) the relative importance of these improvements compared to the impact of delaying NOvA data taking in the near future, or in the further future.

4. LBNE

The P5 committee has asked about the feasibility of the LBNE underground science program. We ask the PAC to comment specifically on the present status of understanding this LBNE science program (supernova, proton decay, …) and what more should be done to further this understanding in the immediate future, before the end of the P5 process. In addition, at the June meeting the committee requested updates, at a future PAC meeting, on the status of the simulations and the understanding of systematic uncertainties, and a risk analysis for scaling the detector up to large masses. We ask the PAC to comment on the current situation and on the progress being made.

5. CMB initiative

The laboratory is exploring a possible role in future wide-field measurements of the CMB. The PAC is asked to comment on the appropriateness of the role being considered.

6. Other

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