

## **Fermilab Physics Advisory Charge - January 2024**

The laboratory continues to align its program with the recommendations in the 2014 Particle Physics Project Prioritization Panel (P5) report: “Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context” and is developing a plan to implement the recommendations in the 2023 P5 report.

---

### **Report by the LBNC**

Charge: For information only.

---

### **Report from the Mu2E experiment**

Charge: We ask the PAC to review the status of the Mu2e experiment. The PAC is also asked to review the status of open recommendations from previous reviews.

1. The PAC recommends the collaboration work with FA to secure the needed personpower from non-FNAL institutions as soon as possible.
  2. The PAC recommends the proponents to carefully evaluate the personpower involved in the upgrades studies and avoid any diversion of personnel or resources from Mu2e to Mu2e-II.
  3. We recommend the Lab to follow closely the readiness for the commissioning phase.
  4. The PAC recommends the experiment monitor at a regular pace a resource loaded schedule for all items needed to be ready for data taking with clear “need by” dates.
  5. The collaboration should consider a physics run before 2027 as a priority and should strive to respect the current schedule. Any delay should be discussed as early as possible with the lab management.
- 

### **Status and plans for the Fermilab’s accelerator complex**

Charge: For information only.

---

### **Report from NOvA**

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the NOvA experiment.

### **Report from ICARUS**

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the ICARUS experiment.

## Report from SBND

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the SBND.

## Report from ND 2x2

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the ND 2x2 experiment.

## Report from FTBF and ITA

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the FTBF/ITA.

## Report from Mu2e

Charge: The PAC is asked to review the impact of the anticipated reduction of beam time in FY24 on the Mu2e experiment.

---

## Status of experiments led by the Particle Physics Directorate

Charge: We ask the PAC to review the status of on-going experiments led by the Particle Physics Directorate (or PPD) in the context of the 2015 and 2022 P5 recommendations. The PAC is also asked to review the status of the open recommendations from previous reviews.

- Recommendations to CMS:
  1. Fermilab streamline site access for US CMS collaborators so that they can easily access the LPC and ROC.
  2. Fermilab should work with DOE to restore adequate funding for the LPC to rebound from the COVID remote-work lull
  3. The LPC ensures regular on-site presence of Fermilab-based experts.
  4. US CMS investigates ways to expand the usage of the Fermilab ROC to help alleviate the current shortage of shifters at CERN.
  5. The Fermilab CMS group has a stable presence at CERN sufficient to contribute to data-taking operations with experts on shift and on call.

---

## Status of the ANNIE experiment

Charge: We ask the PAC to review the status of the ANNIE experiment, including the results of early data taking with LAPPDs and the test run with a small volume of Water-based Liquid Scintillator (WbLS). We also ask the committee to review the progress on the plans for a combined analysis with SBN and future R&D efforts. Finally the PAC is asked to review the status of past recommendations:

1. We recommend that the Collaboration plan carefully for the long term needs of future operation and the analysis of the data, including personnel needs.
- 

### **Overview of the Neutrino Physics Center**

Charge: We ask the PAC to review the activities and programs at the Neutrino Physics Center (NPC). The PAC is also asked to review the status of open recommendations from previous reviews.

1. The NPC should clearly articulate its goals, stakeholders, methods, and needs to continue to promote a rich intellectual environment in the Fermilab and broader neutrino community of today, while keeping in mind the need for evolution to the DUNE era in about 5 years.
  2. The PAC would like to see a short document describing the strategic plans of the NPC.
- 

### **Status of the AI/ML program at the laboratory**

Charge: We ask the PAC to review the status of the AI/ML activities at the laboratory and of the recommendations made at past meetings:

1. Formulate a strategy to respond to future AI/ML calls, not necessarily just for AI/ML centers.
- 

### **Overview of the quantum theory program at the laboratory**

Charge: For information only.

### **Recent results of on-going experiments led by the SQMS Center and spin-off applications for HEP**

Charge: We ask the PAC to review recent results from experiments led by the Superconducting Quantum Materials and Systems Center (SQMS Center) in the context of Fermilab's scientific portfolio as well as the status of early applications of quantum computing and quantum sensing to HEP. The PAC is also asked to review the status of open recommendations from previous reviews:

1. The PAC recommends the Laboratory streamline procedures to improve the efficiency of the procurement process for SQMS Center in coordination with the overall lab efforts to improve procurement.
2. The PAC recommends the SQMS center explore opportunities for collaboration with other groups at FNAL, particularly on quantum sensors.

### **Recent results of on-going experiments led by Emerging Technologies Directorate and spin-off applications for HEP**

Charge: We ask the PAC to review recent results from experiments led by the Emerging Technologies Directorate (ETD) in the context of Fermilab's scientific portfolio as well as the status of early applications of quantum internet and quantum sensing to HEP. The PAC is also asked to review the status of open recommendations from previous reviews:

1. Coordinates with DOE to have FQI projects reviewed and possibly extended to match timing of upcoming funding opportunities.
  2. Develops a long term strategy towards quantum science and how it integrates with HEP goals.
- 

### **Overview of the P5 recommendations**

Charge: For information only.

---

### **Overview of the DEIA activities and programs at the laboratory**

Charge: We ask the PAC to review the status of the DEIA activities and programs at the laboratory and the status of the open recommendations from previous reviews:

1. Develops metrics on diversity to be shared in future PAC meetings.
2. Present its efforts on accessibility in an upcoming PAC meeting.