

## CHARGE FOR THE FERMILAB PHYSICS ADVISORY COMMITTEE JANUARY 2023

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 starts the preparation for the 2022 P5. The PAC is asked to evaluate the laboratory’s current activities in support in the 2014 P5 report.

### Plans for Users and Affiliates Engagement

**Charge:** We ask the PAC to review the laboratory’s plans for users and affiliates engagement in the context of Fermilab as host for both national and international collaborations.

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### Status of the DEI program at the laboratory

**Charge:** We ask the PAC to review the status of the DEI program at the laboratory and of the open recommendations made by the PAC in June 2021:

- The PAC recommends the Laboratory continue and expand its EDI effort, including the SQMS Carolyn B. Parker Fellowship.
  - The PAC encourages/recommends the Laboratory to explore the possibility of different recruitment and hiring approaches, such as cohort or cluster recruitment, as tools to more effectively strengthen an inclusive culture.
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### Status of the AI/ML program at the laboratory

**Charge:** We ask the PAC to review the status of the AI/ML program at the laboratory and to assess whether the laboratory is in position to make a compelling case to become an AI/ML center.

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### Status of the MicroElectronics program at the laboratory

**Charge:** We ask the PAC to review the status of the MicroElectronics program at the laboratory and the status of the open recommendations made by the PAC in November 2021:

- Evaluate the balance and resource-loading of project and R&D activities in accordance with Lab priorities, and report at an upcoming meeting.
  - Continue to pursue external collaborations (industrial, commercial, and academic) to consolidate networks and be in a privileged position to become a DOE Microelectronics center.
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## Status of the SQMS center

**Charge:** We ask the PAC to review the status of the SQMS center and of the open recommendation made by the PAC in June 2021:

- We encourage SQMS to discuss publication policy with the other national quantum centers, which are likely to face similar issues in this area. There may be an opportunity to establish common standards that take into account the traditions and needs of the different disciplines, but that can nevertheless be applied in a consistent way. The PAC would appreciate an update on these discussions in the next meeting.
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## Request for Stage 1 approval for the Spin Quest Upgrade

**Charge:** We ask the PAC to assess the readiness of the Spin quest experiment for Stage 1 approval.

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## Status of the FQI program at the laboratory

**Charge:** We ask the PAC to review the status of the FQI program at the laboratory.

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## Overview of the of the Fermilab's contributions to the Quantum Science Center (information only)

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## Status of the CMS experiment

**Charge:** We ask the PAC to review the status of the CMS experiment at the laboratory and to address the impact of external factors on Fermilab and U.S. deliverables.

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## Updated cosmic frontier strategy

**Charge:** We ask the PAC to review the status and plans of the cosmic program at the laboratory.

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## Report on the Mu2e experiment

**Charge:** We ask the PAC to review the plan to transition from project to operations and for initial data taking.

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### Status of the ICARUS detector

**Charge:** We ask the PAC to review the status of the ICARUS detector and the status of the open recommendation made by the PAC in June 2021:

- The PAC recommends that the improvements in detector characterization from cosmic and neutrino beam running be incorporated into SBN common reconstruction/analysis tools as soon as possible to allow for detailed sensitivity studies including systematics, which may help in prioritizing detector and reconstruction software development tasks as well as the physics goals for the ICARUS-only data taking period.
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### Status of the SBND

**Charge:** We ask the PAC to review the status of the SBND.

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### Status of the SBN Analysis Working group

**Charge:** We ask the PAC to review the status of the SBN analysis working group and the status of the open recommendations made by the PAC in June 2021:

- SBN should support the use of common tools to develop the ICARUS-only physics case. This should include sensitivity projections incorporating systematic uncertainties and backgrounds.
- SBN should begin developing tools for cross section analysis that would help to leverage the unique characteristics of ICARUS. In particular, ICARUS will be sensitive to neutrinos from the (off-axis) NuMI beam, which has a large overlap in energy with the future DUNE neutrino spectrum, allowing for important neutrino-argon interaction studies.

We ask the committee to also review plans for data preservation for the MicroBOON, SBND, ICARUS detectors.

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### Muonium R&D/Physics Program at the MTA

**Charge:** We ask the PAC to review the physics case of the proposed muonium experiment at the Fermilab MTA and the potential of the muonium physics program at the PIP-II.