

Phase-II News


Sowjanya, Stefan, Michel

DUNE Phase-II General Meeting

December 9, 2024

Phase-II White Paper Published!

- This is an important milestone for DUNE
- Thanks to everyone who contributed and made this happen
- A. Abed Abud *et al* 2024 *JINST* 19 P12005



Brought to you by the LANL RESEARCH LIBRARY

IOPscience Journals Books Publishing Support Login

Journal of Instrumentation

PAPER • OPEN ACCESS

DUNE Phase II: scientific opportunities, detector concepts, technological solutions

A. Abed Abud, B. Abi, R. Acciarri, M.A. Acero, M.R. Adames, G. Adamov, M. Adamowski, D. Adams, M. Adinolfi, C. Adriano [Show full author list](#)

Published 6 December 2024 • © 2024 The Author(s)

[Journal of Instrumentation](#), Volume 19, December 2024

Citation A. Abed Abud *et al* 2024 *JINST* 19 P12005

DOI 10.1088/1748-0221/19/12/P12005

[Article PDF](#)



Jinst PUBLISHED BY IOP PUBLISHING FOR SISSA MEDIALAB

RECEIVED: August 27, 2024
ACCEPTED: September 3, 2024
PUBLISHED: December 6, 2024

DUNE Phase II: scientific opportunities, detector concepts, technological solutions

DUNE

The DUNE collaboration

E-mail: s.soldner-rembold@imperial.ac.uk, sowjanya@lanl.gov, sorel@ific.uv.es

ABSTRACT: The international collaboration designing and constructing the Deep Underground Neutrino Experiment (DUNE) at the Long-Baseline Neutrino Facility (LBNF) has developed a two-phase strategy toward the implementation of this leading-edge, large-scale science project. The 2023 report of the US Particle Physics Project Prioritization Panel (P5) reaffirmed this vision and strongly endorsed DUNE Phase I and Phase II, as did the European Strategy for Particle Physics. While the construction of the DUNE Phase I is well underway, this White Paper focuses on DUNE Phase II planning. DUNE Phase-II consists of a third and fourth far detector (FD) module, an upgraded near detector complex, and an enhanced 2.1 MW beam. The fourth FD module is conceived as a “Module of Opportunity”, aimed at expanding the physics opportunities, in addition to supporting the core DUNE science program, with more advanced technologies. This document highlights the increased science opportunities offered by the DUNE Phase II near and far detectors, including long-baseline neutrino oscillation physics, neutrino astrophysics, and physics beyond the standard model. It describes the DUNE Phase II near and far detector technologies and detector design concepts that are currently under consideration. A summary of key R&D goals and prototyping phases needed to realize the Phase II detector technical designs is also provided. DUNE’s Phase II detectors, along with the increased beam power, will complete the full scope of DUNE, enabling a multi-decadal program of groundbreaking science with neutrinos.

KEYWORDS: Cryogenic detectors; Liquid detectors; Neutrino detectors; Noble liquid detectors (scintillation, ionization, double-phase)

ARXIV ePRINT: [2408.12725](https://arxiv.org/abs/2408.12725)

2024 JINST 19 P12005

Neutrinos@CERN Workshop

- Jan. 23-24, 2025 (at CERN, the week before the Jan. Collaboraton Meeting)
- <https://indico.cern.ch/event/1460367/>

This two-day workshop, fostered at CERN by the CERN Neutrino Platform and Physics Beyond Colliders, is aimed at discussing opportunities for performing neutrino physics experiments at CERN using existing, planned, and proposed facilities. The goal is to bring together neutrino physicists to explore these opportunities and provide input for the European Strategy for Particle Physics Update (ESPPU).

The main themes of the workshop are:

- The need for dedicated CERN experiments in the DUNE and HyperKamiokande era, including short-baseline, beam dump, and hadroproduction experiments.
 - Medium- and long-term plans for the ProtoDUNE detector complex and Neutrino Platform experiments.
 - Neutrino physics with SHiP and the LHC far-forward projects (Forward Physics Facility etc.).
- In-person registration is closed but registration for remote attendance is still open

Neutrinos@CERN Workshop

- There are several talks on the CERN neutrino platform and ProtoDUNEs — check out the agenda
- On Phase-II, there are 3 talks

DUNE Phase II, physics and technology

Stefan Soldner-Rembold et al.

40/S2-C01 - Salle Curie, CERN

16:25 - 16:50

Plans for a ProtoDUNE-III Run with Optical Readout in the NP02 Cryostat

Konstantinos Mavrokoridis et al.

40/S2-C01 - Salle Curie, CERN

16:55 - 17:15

Charge Readout Prototyping and Beam Tests for ND-GAr

Tanaz Mohayai

40/S2-C01 - Salle Curie, CERN

17:20 - 17:40

- We plan to hold practice talks for these either the week of Jan. 13 or Jan. 20 — will be announced soon

Upcoming Phase-II Workshops

- **2nd Phase-II FD APEX Workshop, March 12-14, 2025 at Stony Brook University**

- The workshop goals are

- 1) discuss the latest large-area photodetectors and digital readout solutions for APEX,
- 2) discuss APEX scaling-up challenges and industrial solutions for mass production,
- 3) discuss APEX light simulation and reconstruction, light-assisted event reconstruction, and light-enabled physics studies in an APEX LArTPC,
- 4) discuss the CERN 2-ton prototype results and plans, define NP02-scale APEX prototype plans,
- 5) define participating institutions' scopes and the APEX working group organization chart.

- **A non-Ar/THEIA workshop in May 2025**

- Conduct this as part of the May DUNE Collaboration meeting (May 19-23, 2025) with two dedicated parallel sessions

Upcoming Phase-II Workshops

- **A Phase-II FD Pixel workshop in March or April, 2025**
 - being planned for late March or early April (dates being finalized)
 - Will be held at University of Texas, Arlington (POC: Jonathan Asaadi)
 - Two primary goals are to understand synergies b/n various pixel technologies being developed, potential for integration and coordination and developing a proposal for large-scale demonstration of pixel technology at future ProtoDUNE runs
- Emails will follow in the coming days/weeks on all these workshops with more details
- **Phase-II workshops are open to the entire DUNE collaboration and also non-DUNE members who are interested in contributing to Phase-II**
- If you are planning for any Phase-II related workshops, please consult us first

Phase-II@January Collaboration Meeting

- In view of the January Collaboration meeting, we won't be holding a Phase-II meeting in January
- As usual, we will have **3 Phase-II general parallel sessions** at the January collaboration meeting at CERN
 - 1 session will be focused on Phase-II physics, likely on LBL physics organized jointly with the LBL working group conveners
 - 2 sessions will be focused on subgroup updates — *let us know if you are interested in giving an update at the collaboration meeting*
 - In addition to these general sessions, there will be other Phase-II parallel sessions (e.g. APEX, ND-GAr etc.)
 - If you are planning for any parallel sessions that we are not already aware of, let us know ASAP

European Strategy and Phase-II Next Steps

- We are planning to submit a Phase-II document on behalf of DUNE as input to the European Strategy for Particle Physics (ESPP)
 - The document is due in March
 - A big aspect of this will be the CERN neutrino platform and future technology demonstrations with ProtoDUNEs along with cryostats for Phase-II FDs. Physics opportunities and potential will also be emphasized in the document jointly working with physics coordinators
 - We will share more details on this soon
- We are also interfacing with APS-DPF on this and will also soon start communication with CPAD and ECFA