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Charge Letter: LBNC Review of DUNE Vertical Drift Far Detector

Capitalizing on lessons learned from both ProtoDUNE detectors, as well as other work on the dual-phase concept, the DUNE Collaboration has adopted a Vertical Drift design for the second far detector module. The transition to this concept has occurred rapidly and considerable progress has been made over a short time.

After hearing about the Vertical Drift concept and strategy at their December 2020 and March 2021 meetings, the LBNC strongly endorsed vertical drift technology for the DUNE second far detector and went on to “commend DUNE on the impressive progress in developing the design, executing the R&D planned for this year, and building an expert team and organization.” DUNE plans to submit a CDR for LBNC review by Fall 2021.

The LBNC pointed out that the R&D schedule is tight and made the following recommendation: “Work with the LBNC to schedule a review of technical progress and the plans and progress towards a Conceptual Design Report.”

Following through on this recommendation, we ask the LBNC to review the Vertical Drift concept, status and plans, and preparation towards the CDR. The review will be held in a series of 3 sessions, to conclude by the end of May:

- Vertical Drift Technical Design, R&D
- Vertical Drift physics/simulation + assembly/installation/integration
- Vertical Drift timeline, schedule + follow-up Q&A

The LBNC is asked to look at the overall status, progress and plan for the Vertical Drift R&D program, simulation and performance metrics, and plan and timeline for the effort. In particular, we ask the LBNC to consider the following questions:

- Does DUNE have a clear, consistent and realistic view of the major design aspects of the detector and its physics goals?
- Is the technical design and project planning at an appropriate level for a CDR?
- What are the primary areas of R&D focus? What are the critical new aspects of the design, what key technical challenges, and are they being addressed?
- What are the key milestones associated with this R&D?
- What are the plans for the NP02 ProtoDUNE-VD? Are they credible? Are they consistent with the timeline outlined above?
- Does DUNE have a good plan for consortia contributions to the VD effort? What is the status of planning for construction and installation?
- Does DUNE have sufficient personnel actively working on VD so that it can move forward on the anticipated timeline?
- Does DUNE have a plan for simulation and other studies which support the physics capabilities claimed?
- Is DUNE on track to complete the CDR on the proposed schedule?

Although this review is of the international DUNE Vertical Drift effort, some aspects of the findings and recommendations will be of direct relevance to the DUNE-US project, including the CD-1 “refresh” that is expected to take place later in calendar year 2021. Also of relevance to DUNE-US project review and approval is the development of a CDR and the timescale for “baselining” (CD-2).

The Committee should plan to deliver a closeout report by June 1, 2021 and provide a full report by June 15.