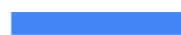


# PLANS AND MILESTONES FOR THE DUNE NEAR DETECTOR CONCEPTUAL DESIGN REPORT

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# CDR Timeline



Mike Kordosky  
Steve Manly

# Definitions

- **DUNE TDR:** (a.k.a., “Far Detector TDR”, “the TDR”) [doc-15415](#) This is the TDR describing the experiment as a whole and the Far Detector. Tim Bolton and Sam Zeller are the editors. It is the TDR we have all been working on for the last year or so. LBNC will finalize and recommend it this fall.
- **CDR-lite:** (“ND CDR-lite”) This is the document that ND working groups have contributed to, through Steve and Mike. It was originally envisioned as a chapter in the DUNE TDR but was turned into an appendix late in the process.
- **ND Introduction:** This is a roughly 12 page chapter in the “TDR volume I: Introduction to DUNE” part of the TDR.
- **Executive Summary:** We have at various times referred to the CDR-lite and the ND Introduction as an “executive summary”. This reflects misunderstanding at some level, and the changing nature of the deliverable. The TDR executive summary chapter now has a 3 page section on the ND.
- **ND CDR:** This is the document we are starting on now. It will be an evolution of the CDR-lite (i.e., we will start with the CDR-lite and modify it).
- **ND TDR:** A standalone TDR for the ND, nominally due at the end of 2020. Perhaps will officially be the 6th volume of the DUNE TDR?

## **CDR timeline - I**

- LBNC mini-review of the ND contribution to the DUNE TDR took place in early June.
- Internal readers of the ND contribution to the DUNE TDR sent us comments in mid June
- We made some edits in reaction to the two bullets above. Not a lot though.
- LBNC review of the DUNE TDR took place on July 31.
- DUNE TDR being finalized now. We will do a quick cleanup on the ND contributions, particularly the appendix (CDR-lite). We will not add new content (recommendation of the LBNC).
- LBNC feedback to us in mid-September. Hopefully minor.
- We react and give them what we consider to be a final document in late September. Freeze out the CDR-lite.

## **CDR timeline - II**

- Late September: CDR-lite copied and becomes the working CDR.
- October: a month of editing.
- End October: a version of the CDR available for internal review
- Mid-November: internal review complete
- Mid-December: A second version of the CDR. Will make it available to the LBNC

The CDR will describe the DUNE near detector concept the Collaboration agreed on after a design process of 4 years.

- It includes 3 subdetectors: a pixelized LArTPC, a magnetised HPgTPC (MPD) and a magnetised scintillator tracker (3DST).
- It incorporates the PRISM concept (i.e. measurements at different off-axis angles).

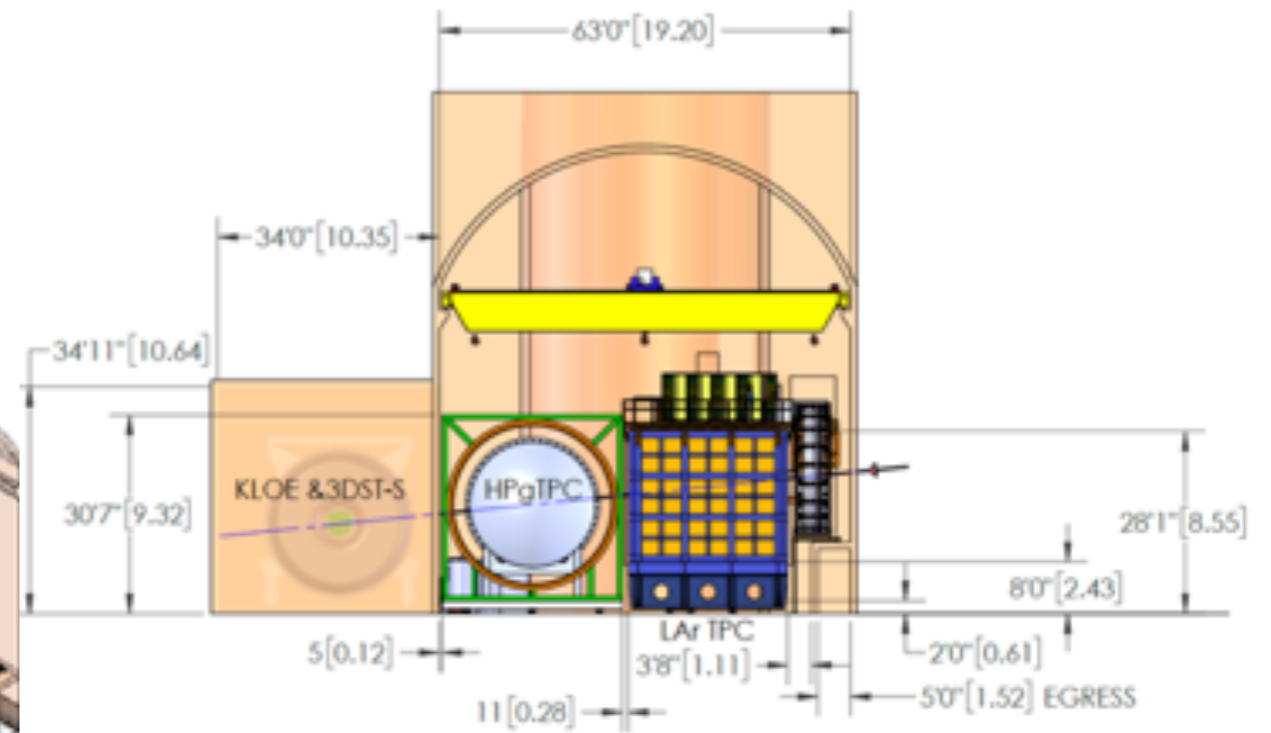
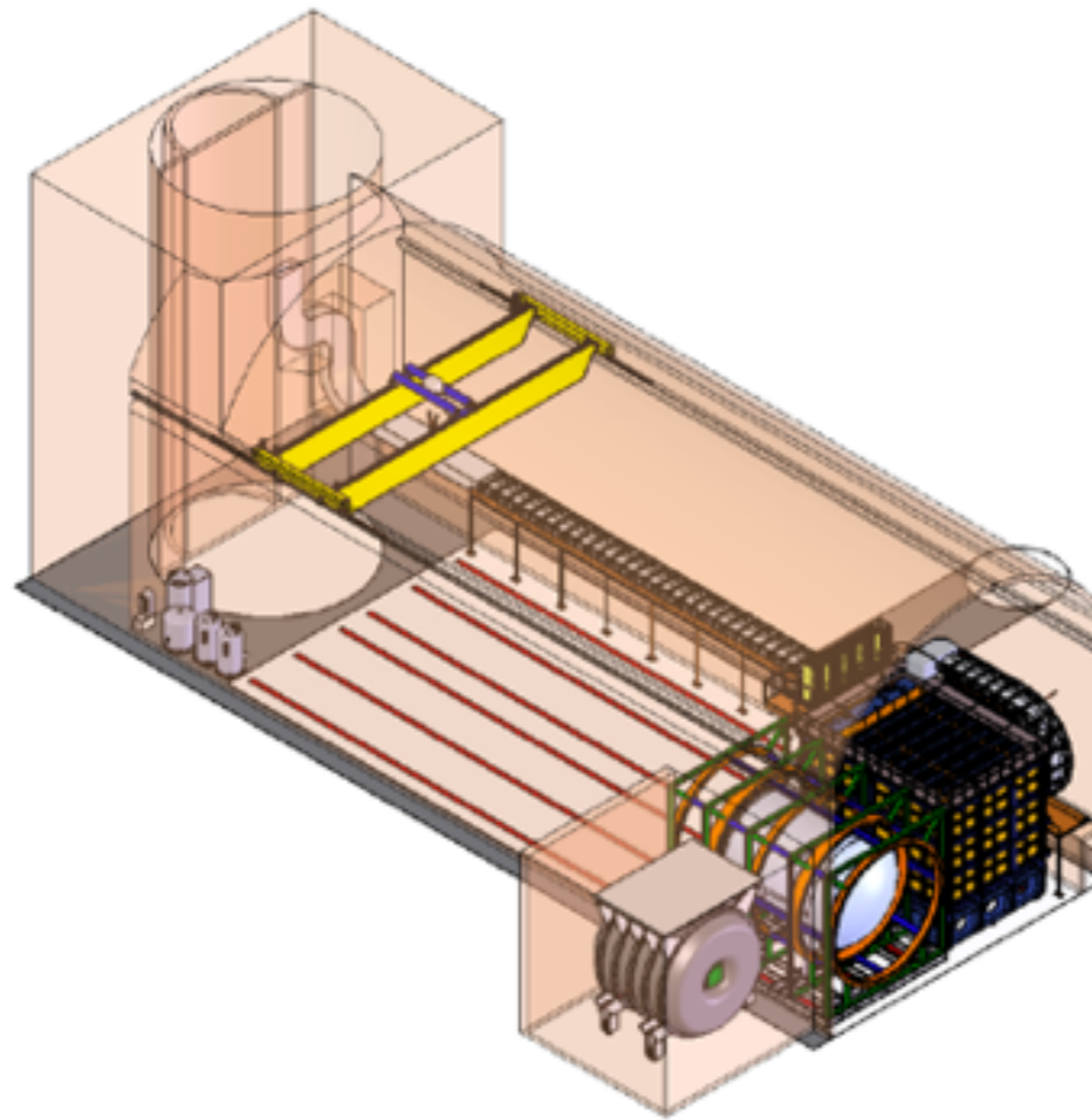
The main purpose of the DUNE ND is the *CP violation* measurement (constraint of systematic errors measuring the neutrino flux and Ar cross sections). The stress on the CDR will be on this.

However, the CDR will include as well a chapter/section on BSM physics searches enabled by the ND (and another one on "Standard-Model physics").

From Mike Kordosky:

*"A concrete section. A chapter. Steve and I are editors, not sole authors. We try to set the structure, write overview, introductory, and conclusion sections. We provide 'glue' and edit sections that are given to us. So, we are expecting a chapter. (...) A few 10's [of pages] would be OK."*

# THE DUNE ND CONCEPT



The BSM physics studies we prepared for the DUNE TDR are possibly better suited for a CDR. However, the focus of the ND CDR *should* be the detector, and thus I see little merit in copying verbatim what we did for the TDR.

The CDR editors suggested focusing on the additional physics opportunities that a capable, multipurpose ND provides. In particular, they would like to see the case of the 3DST and MPD strengthened.

My proposal: pick the *signature studies* that showcase certain capabilities of the DUNE ND and describe them in that context. Also, use this opportunity to convince the collaboration and the community of the importance of the BSM physics program.



A possible skeleton (with tentative names):

- **Introduction:** General description of the BSM physics program. Importance, opportunities, connection with the ND design. [Alex, Jae, Pedro, Kevin]
- **Light dark matter:** Massive LArTPC, PRISM. [Kevin/Valentina].
- **Neutrino tridents:** Massive LArTPC, charge measurement, muon-pion ID. [Justo/Mike W.]
- **Heavy Neutral Leptons:** Large detector volume, charge measurement, PID [Justo/?].
- **Other?**