#### **Technical Proposal Planning**

Tim Bolton, Sam Zeller LBNC Meeting February 19, 2018

The TP is an intermediate milestone on the path to the TDR.

- How this being organized (Who)
- The content we are planning to deliver (What)
- Schedule for delivering the Technical Proposal (When)



# **Reminder: Purpose of the TP**

- This is not a project document that proves that we can build this detector on time and on schedule.
- This is a collaboration document that is a narrative of what the detector is, why it's being built this way, and what it's for.
- It is a technical document that should not be too different from the TDR. TP is to help us with the TDR and not get in the way.
- We need to produce a very high quality document.
  - This is a \$B-class very high profile worldwide experiment so the TP should be written to that level.
- TP will end up on the archive and should be self-contained. This will be an important reference document.



#### **Roles and Responsibilities**

#### **Consortia and consortium editors (next slide)**:

- The TP is a product of the consortia
- Consortium editors own their sections

#### **Overall editors (Tim Bolton, Sam Zeller):**

- Will not be supplying content
- Our role is to organize and coordinate
- The document needs to be a coherent whole
- Our job is to bring this all together

The real work is happening in the consortia ...



#### DEEP UNDERGROUND NEUTRINO EXPERIMENT

#### Who

#### Structure of the Technical Proposal

- Volume 1: Executive Summary (Ed Blucher, Mark Thomson)
  - o LBNF and Far Site Facilities
  - o DUNE Far Detectors
  - DUNE Near Detector
  - o DUNE Physics (Albert de Roeck, Jon Urheim)
- Volume 2: Single-Phase DUNE Far Detector (Mitch Soderberg)
  - Design Motivation (~5 pages)
  - Overview of the Single-Phase Far Detector (~10 pages)
  - APAs (~30 pages) (Dave Schmitz)
  - o HV System (~30 pages) (Rob Plunkett)
  - TPC Electronics (~30 pages) (Mike Mooney)
  - Photon Detection System (~30 pages) (Bob Wilson)
  - DAQ (~30 pages) (Jim Brooke, Brett Viren)
  - o Slow Controls & Beam Instrumentation (~20 pages) (Glenn Horton-Smith, Carmen Palormares)
  - Detector Performance (~10 pages)
  - Responsibilities (~10 pages)
- Volume 3: Dual-Phase DUNE Far Detector (Dominique Duchesneau)
  - Design Motivation (~5 pages)
  - Overview of the Dual-Phase Far Detector (~10 pages)
  - o CRPs (~30 pages) (Dominique Duschesneau, acting)
  - o HV System (~30 pages) (Francesco Pietropaolo, acting)
  - TPC Electronics (~30 pages) (Slavic Galymov, Jamie Dawson)
  - Photon Detection System (~30 pages) (Burak Bilki, Clar Cuesta)
  - o DAQ (~30 pages) (Jim Brooke, Brettt Viren)
  - Slow Controls & Beam Instrumentation (~20 pages) (Glenn Horton-Smith, Carmen Palormares)
  - Detector Performance (~10 pages)
  - Responsibilities (~10 pages)
  - Volume 4: Installation and Integration (Steve Kettell)
  - Volume 5: Software and Computing (30-50 pages) (Andrew Norman, Heidi Schellman)
    - o Computing model and technology options

DUNE

 22 volume and chapter editors (nominated by the consortia)

So far, we have •
held 2 overall
planning
meetings with
this group

# What: High Level

- This is a technical document ...
  - So we can assess what's being built and convince people that it can be built
  - This is a description of the apparatus and how it will be used to do science
- The TP will include and definitive statements about the design (no "maybes") and a justification of design choices
- We want the designs to flow from requirements that connect directly to the physics of the experiment
  - Plan in the TP is to emphasize the connection between physics goals and detector performance. This is important.
- More on what this document is and isn't ...



# What: Introductions

- The introductions are extremely important.
- Want to provide a description that is as clear as possible of what the purpose of each system is and it's parts. Why is each system designed the way it is? How does it connect to the physics? Some examples:
  - Photon detection system: What is the system for and why are we building it this way?
  - DAQ: How is the design strategy tied to DUNE's physics goals?
  - Slow monitoring: What are we monitoring and why?
- We don't want to assume the obvious.
- Want to articulate why certain design decisions have been made & retained (examples: why wrapped APAs, cold electronics, etc.)



## What: Options

- There should not be a large number of open options articulated in the TP. Options should be narrowing.
- Where there are options, these should be spelled out along with outlining a decision making process. In particular, how will design options be resolved?
- Connect to the protoDUNEs. It may be that some of these options will be resolved after operational experience with the protoDUNEs.
- No wish lists
- Want to give the reader a sense of how this all comes together



# What: Risks & Vulnerabilities

- Encouraged editors to point out vulnerabilties and call them out. This is an opportunity to further articulate what has been written down in the risk spreadsheets. Spelled out some examples ...
  - What if cannot achieve the nominal drift HV?
  - What is the impact of excess noise on data rates in the DAQ?
  - What is the tolerance of the technology to dead channels?
  - Are there any issues with operating for a long time in an unattended state?
- Discuss trade-offs and possible mitigation. For example ...
  - Electric field vs. purity
  - Tolerance of TPC performance wrt dead channels



## What This is Not

- This is not a project document
- In this document, we want to consolidate and summarize project-oriented sections
- TP will include:
  - a very high level schedule
  - timelines and key milestones
- TP will not include:
  - costs (will be developed in other documents)



## How Do We Get There

- This is a very large document and we need tools to handle this. We are using existing DUNE structures that include:
  - LATeX, github (<u>https://github.com/DUNE</u>), Overleaf (new)
- Anne Heavey is providing technical assistance to the team
- Templates were distributed to provide a basic level of cohesion, but we want to avoid telling people exactly how to write their sections
- Held a series of special sessions on using these tools in January. Anne was also available at the DUNE collaboration meeting.



#### When

We are writing a complex document that is inherently iterative. Tim and I gave some additional structure to the schedule:

- December 20, 2017: TP/TDR kick-off meeting
- January 12, 2018: Table of contents due (at section heading level)
- February 23, 2018: First rough draft of TP due
  - TDR editor-led informal review. Use as a calibration to see if we have the right balance between sections/content.
- March 16, 2018: Second rough draft of TP due
  - Draft should be in good enough shape to to be sent to "external" reviewers.
- April 13, 2018: Third and final version of TP due
  - No major content changes expected beyond this point.
- May 11, 2018: TP submitted to LBNC
  - Document that the whole collaboration owns. Publication quality.



#### Summary

- The TP is an important technical document produced by the collaboration that provides a narrative on what the detector is, why it's being built this way, and what it's for.
- We aim to produce a high quality document.
- We are off to a good start. Outlines all came in on time and point towards a high quality document emerging.
- We have a lot more to do and a short time to do it.
- We will be producing a revised draft each month (that will be reviewed by the collaboration) with plans to provide a final document to the LBNC prior to the May collaboration meeting.



#### Backup



#### TDR vs. TP

- Technical Design Report (TDR)
  - Multi-volume document of O(10<sup>3</sup>) pages
  - Major technical and project elements
  - Part of formal review and approval process
  - Targeted at funding agencies
  - Mid-2019 completion
- Technical Proposal (TP)
  - One volume document of O(10<sup>2</sup>) pages
  - Focus on technical description
  - Establishes the framework for the TDR
  - Targeted at LBNC
  - May 2018 completion



#### **Overall Schedule We Received**

#### 4. Timeline and Milestones

There are number of assumed dates that frame the programme of work:

- Oct-17: Editors of TDR volumes appointed
- Nov-17: TP/TDR Kick-off meeting outline of contents
- Dec-17: Complete tables of contents of TDR and TP (section heading level)
- Apr-18: Complete drafts of the TP volumes
- May-18: Final version of the TP submitted to the LBNC
- Jul-18: LBNC review of the TP
- Feb-19: First drafts of all TDR volumes
- Mar-19: TDR internal review
- Apr-19: Final version of TDR submitted to the LBNC
- May-19: Cost appendix submitted to RRB Cost Scrutiny Group
- Jun-19: Finalize response to questions from LBNC
- Jul-19: LBNC review of TDR



#### DEEP UNDERGROUND NEUTRINO EXPERIMENT

#### **An Example Outline**

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