

ND CDR Status

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DUNE LBNC Meeting

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Outline

- The ND sections in the TDR – a.k.a. "CDR-lite"
- Responding to LBNC & closing out the TDR sections
- CDR structure
- CDR timeline
- Recent planning and work
- Places where help is needed:
 - Requirements, "Standard Model" section, computing
 - Need for additional quantitative studies and revisions to previous studies (coherence)\
- Future activities

The ND sections in the TDR

- Occasionally called the ND executive summary
- Original (Fall '18) thought was of a relatively short document
- We solicited contributions describing the detectors and got a lot of help!
- **The baby grew up fast**, and we let it morph into a "CDR-lite".
 - First version for LBNC appeared in May, followed by a ND mini-review in early June.
- It turns out, there are 7 different ND sections in the TDR....

The ND sections in the TDR

- The "CDR-lite" is organized as 5 appendices in vol-I of the TDR
 - 81 pages, 50 figures --> a good start on a full CDR
 - Many contributing authors --> a real team effort
- The TDR executive summary has a 3p ND section that summarizes this "CDR-lite".
- The Introductory volume (v1) has a 12p section, also a summary.
- CDR-lite will transition into the full CDR in the coming months.

The ND concept

- Basic concept has been agreed on since Summer 2018
 - One detector complex.
 - Three detectors in partnership: LAr, MPD, 3DST
 - Hall constructed to enable PRISM
- Favorable Feedback from LBNC
- Potential for changes still exists due to
 - Practical / engineering issues
 - New ideas
 - Proposed contributions
- Philosophy is to produce a CDR with our best current guess
 - Can indicate where things are fluid.

LBNC Feedback

- *"The LBNC subcommittee reviewing the ND is generally quite satisfied with the content and structure of the ND parts of the executive summary volume. We think that nothing essential is missing and that the overall approach is the right one..."*
- 11p of comments follow. Major items:
- Requirements & lack thereof, particularly numbers: OK for now, but CDR will need more
- If KLOE is part of the plan it should be included in figures & described
- Clarify assumptions about different numbers (rates, etc).
- Carbon --> Argon skepticism
- Improved explanation of PRISM desired

Proposed CDR Structure

- **We have a good starting point to expand upon**
- Proposed chapters:
 - **Ch 1.** Introduction & role of the near detector complex in oscillation analyses
 - A. Why do we need it (overarching requirements).
 - B. Short introduction on the detector apparatus, how it fits together to satisfy the mission.
 - **Ch 2.** LAr design and performance
 - A. Detector hardware design & R&D
 - B. Performance studies
 - **Ch 3.** MPD design and performance (A&B as above)
 - **Ch 4.** 3DST design and performance (A&B as above)
 - **Ch 5.** The PRISM concept
 - A. Description of the concept. Oscillation studies.
 - B. Hall requirements & operation plan

Proposed CDR Structure

- **Ch 6.** Neutrino flux measurements
- **Ch 7.** Neutrino cross-section measurements
 - A. To constrain the cross-section model for osc.
 - B. To explore the S.M. (electro-weak, QCD, hadronic/nuclear physics)
- **Ch 8.** BSM physics with the ND
- **Ch 9.** Near detector hall & facilities.
- **Ch 10.** Computing for the near detector
- **Ch 11.** Summary of requirements
- References & glossary

Timeline

- **Minimal timeline** designed to get a CDR out to LBNC by the holidays --> This has long been the mission
- **Very challenging**, but at least we have a start
- Reacting to LBNC comments now – week ending Oct 4th
- Freeze out TDR contribution & transition to CDR – week ending Oct 11th
- 1st draft of CDR contributions from subgroups due Friday Oct 11th
- Incorporating contributions and revising:
 - weeks ending Oct 11 – Nov 8 --> first draft (4 wks)
- Internal review period: Nov 8 – Nov 22 (2 wks)
- Second draft period: Nov 22- Dec 20 (4 wks, including T'giving)
- **Fits, but barely**

Activities since the LBNC review

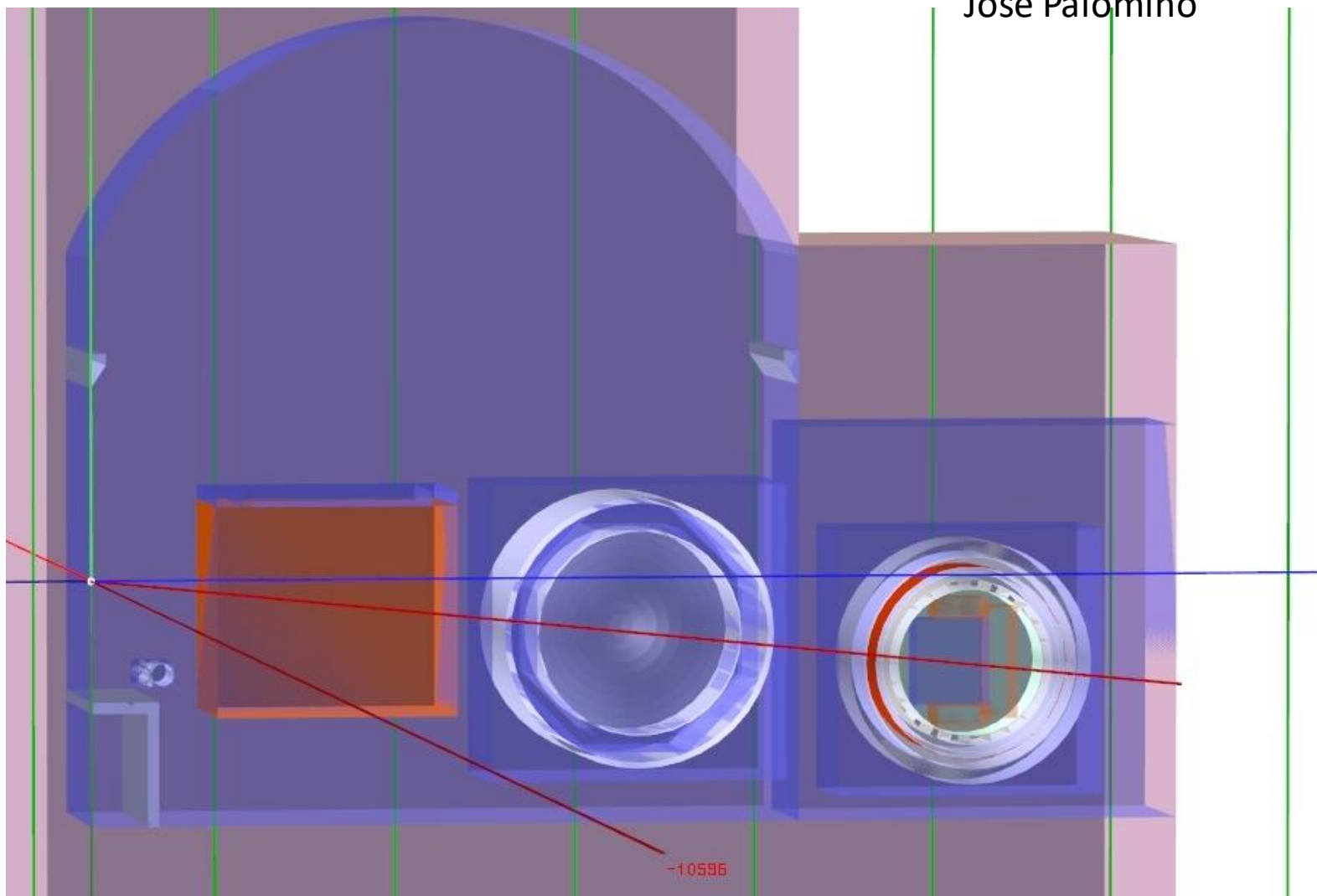
- Some touch up to the TDR contribution in the first few weeks of August, then a holding pattern awaiting feedback (came 1 week ago)
- **Meetings with the major subgroups** Week of August 12:
 - LAr, MPD, 3DST, PRISM, BSM, ND Software Integration
 - Relay the TDR situation and feedback as we had it
 - Learn what groups had in mind for CDR... and what we wanted
 - Communicate the draft timeline & understand what is possible.
 - Go over group responses to internal (DUNE) reviewer comments received in July. This will be fed back into the CDR.

Activities since the LBNC review

- **Software needs**
 - Review pointed out the need for consistent assumptions in studies
 - Need for additional quantitative studies on the CDR (and beyond) timescale.
 - Backgrounds from one detector to the other, or from the rock, were identified as a worry in various studies.
 - Need to tie the detectors together.
- **ND Software Integration group** was given a goal
 - Produce a unified geometry including the hall and detectors
 - Establish the procedure for generating events in the detectors & hall and overlaying them to produce a spill.
 - Do the generation up to the GENIE level (lowest common denominator needed by subgroups).

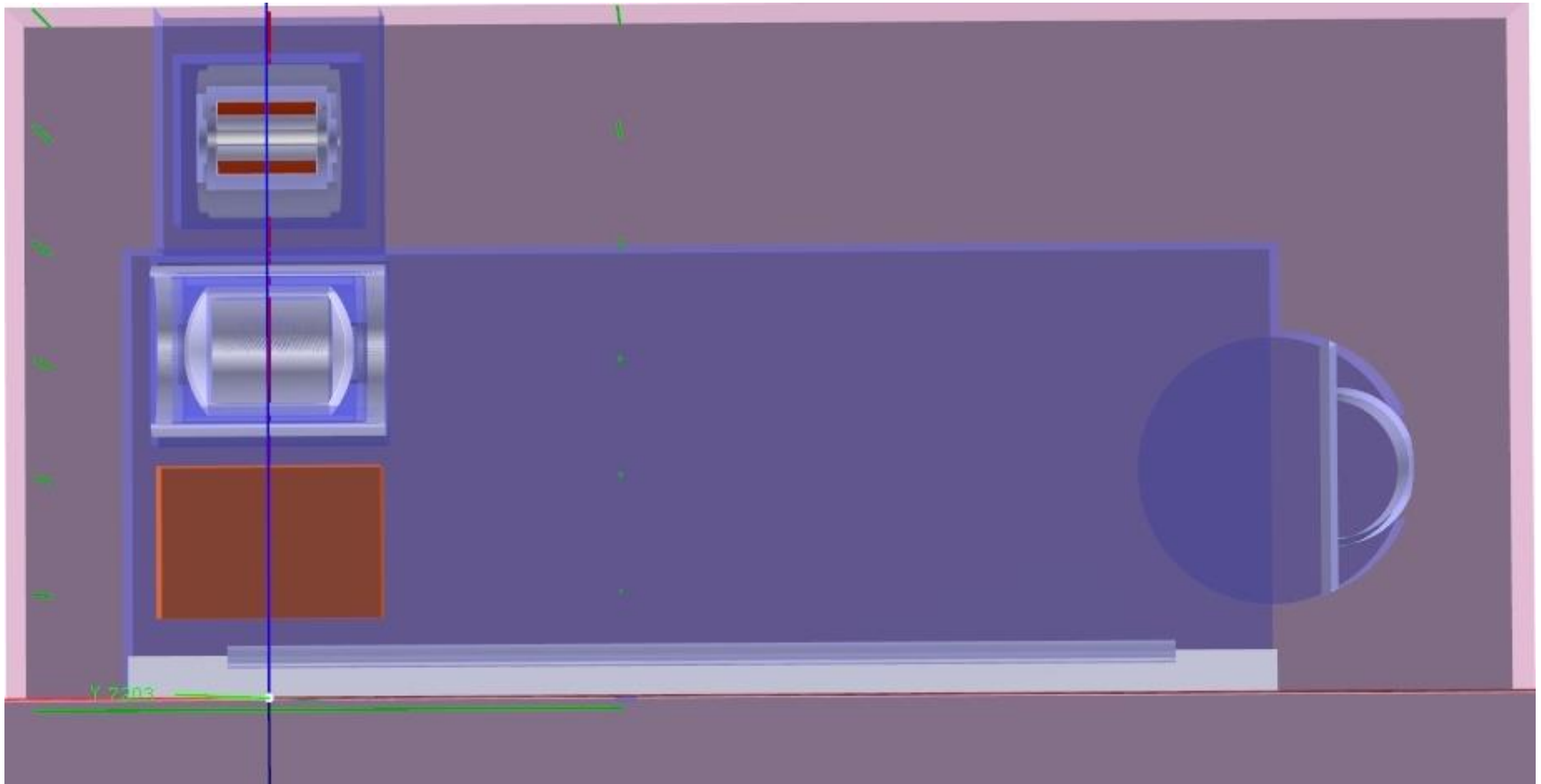
Software progress

Perri Zilberman
Eldwan Brianne
Guang Yang
Jose Palomino



Software progress

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Effort needed & worries

- The subgroups each have sets of goals and deliverables.
 - There is, in general, a need for additional quantitative studies
 - ... and for revisions of previous studies with coherent inputs.
- Requirements, with hard & defensible numbers, are increasingly necessary. We need a procedure to generate them.
- Neutrino cross-sections chapter has long needed authors.
 - We now have a few people interested, but coordination necessary.
- Need an author for the computing chapter (new).
- Need an author for the infrastructure chapter.

Future activities

- We are entering an intense period of work.
- Contributions to the CDR need to be presented openly and with enough time for questions and thought.
- Studies need to use common tools and inputs.
- We propose to begin using the off weeks of the existing ND meeting to serve the CDR process
 - We will be asking workers to give updates on particular topics, rather than open solicitation for contributions.
 - Suggestions are welcome of course.
 - This will go on through the CDR process.