

# DUNE ND-LAr Institute Board

February 16, 2023

# Agenda

- MoU Status
- 2x2 Update
- Analysis Organization Update
- Analysis Workshop

MoU

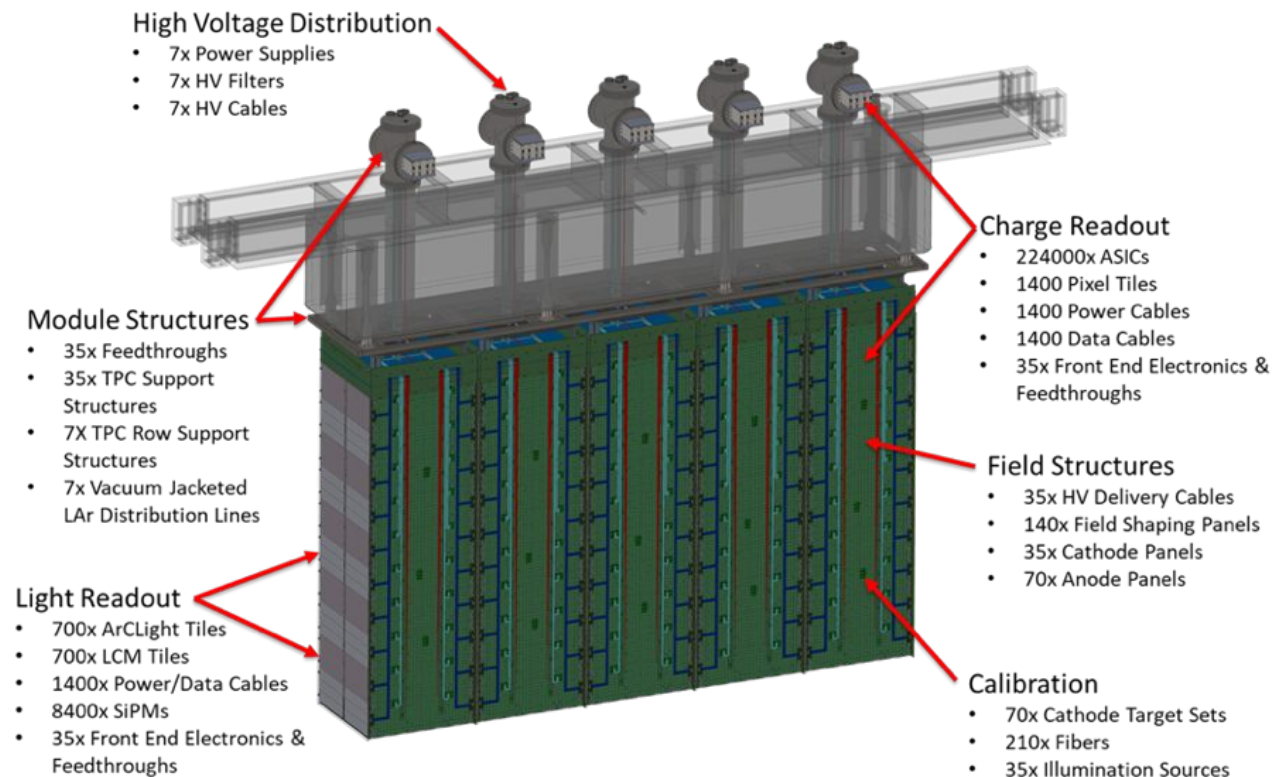
# MoU

- DUNE MoU annexes for FD1 and FD2 going through RRB
  - Far detectors, similar structure as ND-LAr MoU
  - Common funds: see DUNE IB

## ND-LAr Mou

- Presented initial draft in August 2022
  - Annex for ND-LAr to the DUNE multi-institutional MoUs
- Iterations with PIs and feedback from DUNE resource coordinator (G. Barker)
  - Funding will be included in appendix only, also not in WBS tables
- Consensus in October 2022 among ND-LAr PIs and funding agencies on the scope, shares of funding
- Formal signatures when DoE is ready “before CD2”

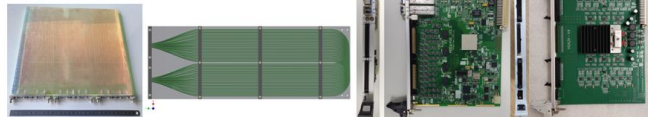
# Overview of deliverables



# Structure for each WBS (example light readout)

## 131.ND.02.06: Light Readout

### Design sketches



### Scope Summary

Design and production of the light readout system for the ND LArTPC modules, including parts for demonstrators. Deliverables are the LCM light traps and ArCLight light traps, SiPMs, SiPM circuit boards, cabling and feedthroughs, with SiPM biasing, readout, and control electronics and enclosures. The control and configuration software/firmware, the power supplies, the clock distribution/synchronization system for the light readout. Component testing/QC/QA, associated tooling, as well as packaging and shipping, and support personnel for prototyping, A&T, and I&I, and their travel.

### Deliverables

Task/Item	Qty	Spares
1 LCMs	2100	420
2 <u>ArCLights</u>	700	140
3 <u>SiPMs</u>	8400	1680
4 Cold-PCBs	2800	560
5 Light Readout Feedthroughs	70	14
6 <u>Microcoax</u> Cables (diff <u>signals</u> )	1400	280
7 <u>SiPM</u> .PS (Biasing) modules	70	14
8 <u>SiPM</u> .PS & VGA control units	35	7
9 VGA unit	280	56
10 ADCs (readout)	175	35
11 ADC sync and trigger units	35	7
12 WR switch	2	1
13 VXS crates	35	7
14 HV power units	35	7
15 Optical cables	245	49
16 LV power units	35	7
17 <u>Power&amp;Signal</u> Adapter boards	280	56
18 LRO Slow control software	-	-
19 LRO DAQ software	-	-

### Contributing Institutions

Design: Bern, JINR

Delivery of components: Bern (2), JINR (1,6,12,13,14,15,16,17,18,19), JINR/Marathon (4,5,7,8,9), JINR/AEI(10,11)

QA/QC:

QA/QC and characterization		
LCM Light Yield test		JINR/Marathon
LCM coating		JINR/Marathon
<u>ArCLight</u> LY test		Bern
<u>ArCLight</u> coating		Bern
LCM assembly: QA/QC		JINR/Marathon
<u>ArCLight</u> assembly: QA/QC		Bern
<u>Microcoaxial</u> cable assembly: QA/QC		JINR/Marathon
Cold electronics: QA/QC		JINR
VGA: QA/QC		JINR/Marathon
<u>SiPM</u> .PS: QA/QC		JINR/Marathon
ADC and WR synchronization: QA/QC		JINR
Ribbon twisted pair cable: QA/QC		JINR/Marathon
Feedthrough QA/QC		JINR

Assembly: Bern, JINR

Packaging and shipping: Bern, JINR

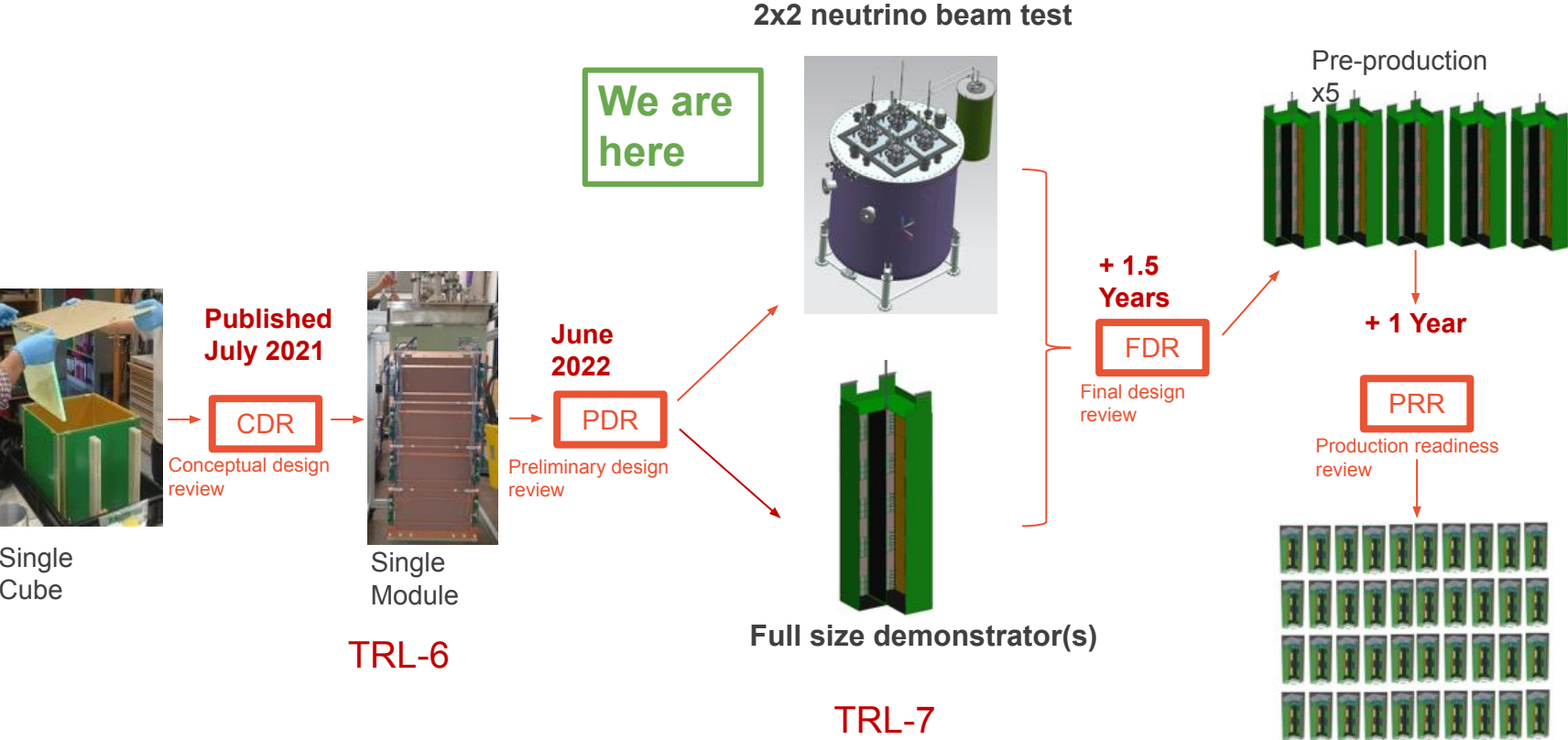
ND A&T: Bern (fraction), JINR (fraction), FNAL

ND I&I: Bern (fraction), JINR (fraction), FNAL

Same structure for all WBS

# Status of ND-LAr and 2x2

# Toward construction





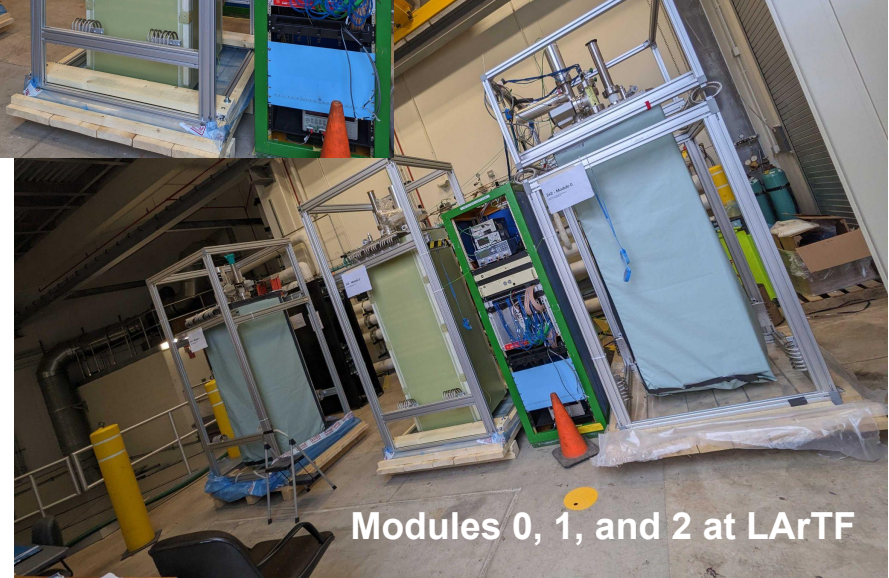
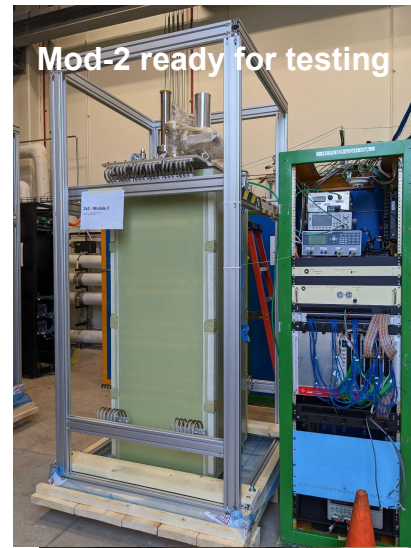
# 2x2 Module Preparation

Modules-0,1,2 at Fermilab:

- Mod-0 and Mod-1: testing completed
- Mod-2 passed ORC & testing started this week

Module-3 at Bern:

- Assembled and tested
- Currently investigating anomalous behavior seen during testing
- Expect to ship to FNAL in March



# MINOS underground area

## MINERvA reconfiguration

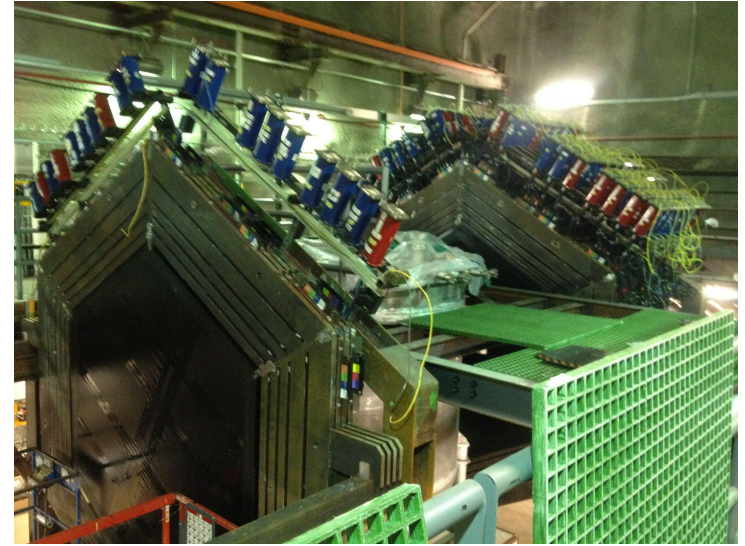
- All modules & readout electronics installed and checked out
- Waiting on neutrino beam for final checks

## Cryostat/cryogenic systems

- Cryostat + access platform installed. Gates, railings, and step installation in progress
- Internal piping and pump stand under fabrication, ready to install in next ~1-2 weeks
- Condenser system partial rework in progress at Cryomech

## Infrastructure upgrades

- AC distribution: contract bid in progress, work to start soon
- ODH fan/ducting: final design review in progress, timelines to be firmed up soon



# 2x2 report to IB End October 2022

## 2x2

- Cryostat at FNAL
- Mod-0 and Mod-1 at FNAL and modified
- Minerva installation underground significantly advanced

**Missed the milestone to have all modules ready for installation at the end of Sept 2022**

Assessed the situation Oct 13th

- Defined more clearly the separation of responsibilities between “modules” (James/Louise) and infrastructures (Ting)
- Reiterated 2x2 priority with FNAL leadership
- Acknowledged need for a single point of contact and coordinator
- Acknowledged weakness in communications at several levels



OLD SLIDE AS  
REMINDER  
October 2022

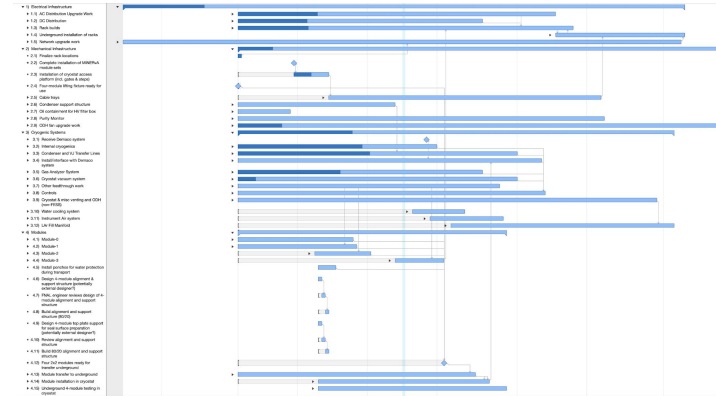
# 2x2 organization and milestones

- Welcome Jen Raaf as 2x2 Lead
- Detailed schedule with dependencies
- Milestones coming up:
  - DeMaCo cryo delivery End Feb
  - Four modules ready for installation End Mar
  - MINERvA installation complete Apr
  - Further: install modules into the cryostat, cryo installation, cabling, AC, ODH

## Consortium Management

Consortium Lead: *M. Weber*  
Technical Lead: *D. Dwyer*

Lead Engineer: *A. Lambert*  
Detector Systems Lead: *I. Kreslo*  
**2x2 Lead: *J. Raaf***  
**Physics and Analysis: *P. Ochoa***



# We need a 2x2 Run Coordinator

## Please make nominations to Dan/Michele

### “Job description”

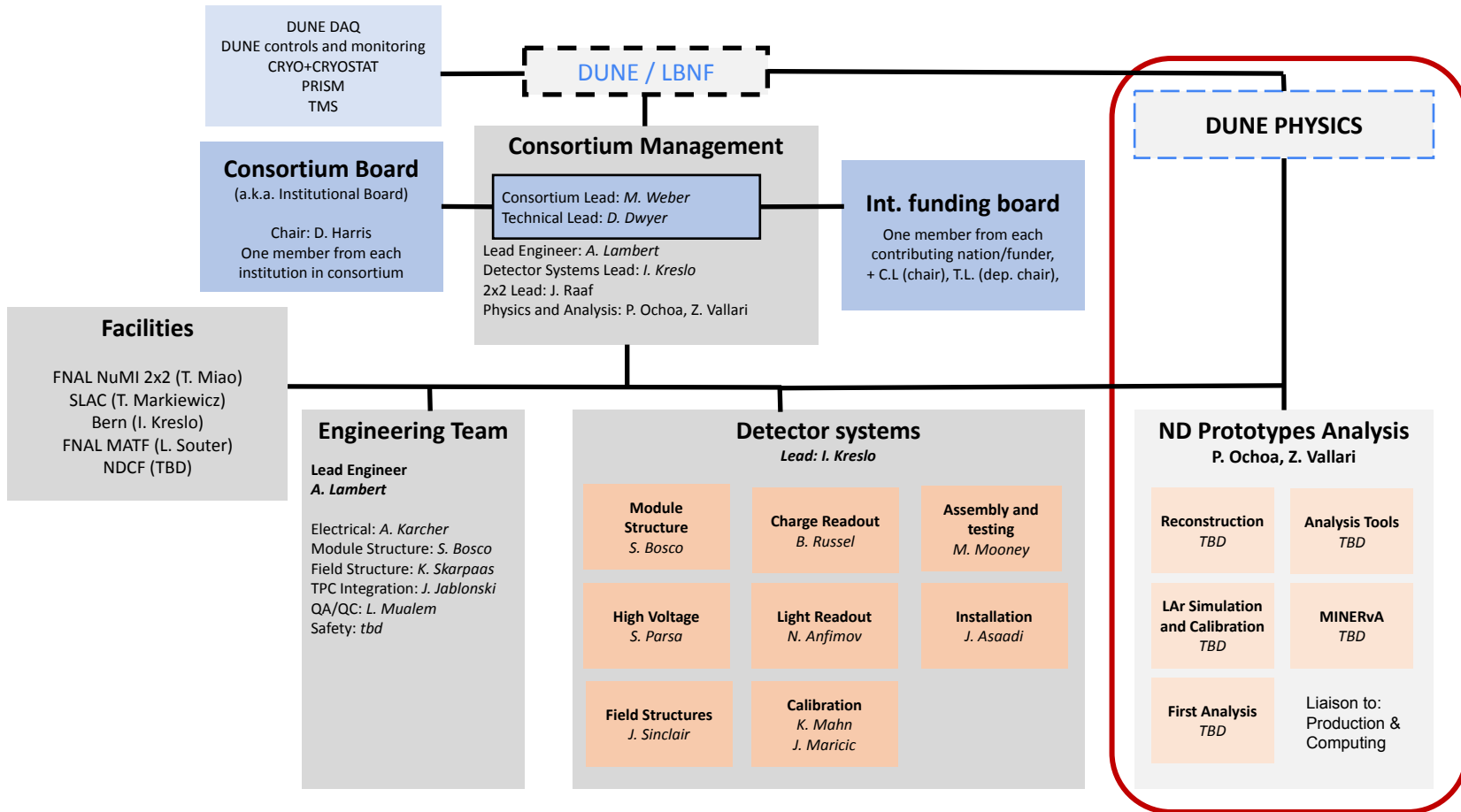
- At least PostDoc level
- Experience with operation of LArTPCs
- Local at Fermilab starting ~April, term is negotiable (>3 M)
- Availability asap (make commissioning plan)
- Commissioning of the 2x2
  - After construction is complete, lead filling, checkout, readiness for data taking
- First Operation of 2x2
  - Run plan, data taking, shifts, coordinate experts, contact for FNAL Ops/Cryo/MCR, reports

# Physics and Analysis

# Latest Developments

- 2x2 Analysis workshop at the University of Bern in January was very productive
  - Slides available here: <https://indico.fnal.gov/event/57076/>
  - Summary of main outcomes reported at collaboration meeting: <https://indico.fnal.gov/event/53965/contributions/258485/>
  - Many areas for new people to get involved!
- ND Prototypes Analysis Working Group now created under the umbrella of the DUNE physics organization:
  - Zoya Vallari and Pedro Ochoa as conveners
- Currently going through a structuring process:
  - Appointing subgroup conveners to work efficiently and to make it easier for newcomers to get plugged in
  - Finding new meeting time (please vote if you haven't already): <https://doodle.com/meeting/participate/id/bY7Nwy0e>







# Analysis Targets for Next Few Months

- Amount of data we can aspire to before the summer shutdown: ~1 week
- Main goals for the next few months:
  - Produce a first sample of ~10x that size before the collaboration meeting
    - Target #1: produce 10 weeks of 2x2+MINERvA simulated data until the larnd-sim stage by **February 28**
    - Target #2: complete first iteration of reconstruction and CAF-making of those 10 weeks by **April 30**
  - Settle on a first analysis target that we can publish with the first data
    - Needs to be something relatively simple
    - Important for FDR
    - To be decided soon so we can start working in that direction
  - Begin calibrating and reconstructing MINERvA data (already fully installed)
  - Continue to exercise and improve the LAr calibration & reconstruction algorithms with the cosmic data