

Introduction to the Workshop

Pedro Ochoa-Ricoux and Zoya Vallari

ND Prototypes Analysis Workshop

May 19-20, 2023



UCIRVINE

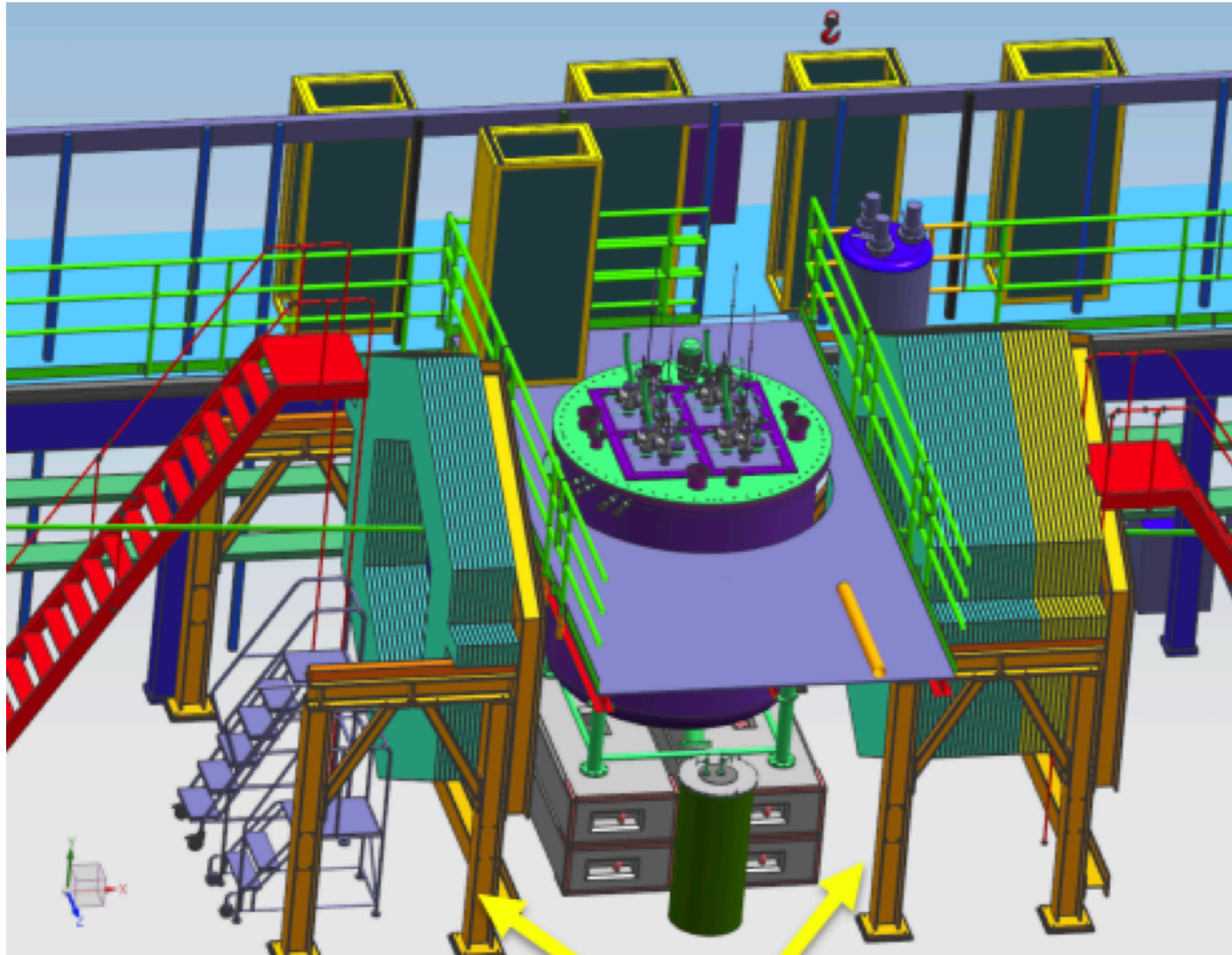


Caltech



Welcome!

- Welcome to the ND Prototypes Analysis Workshop!!

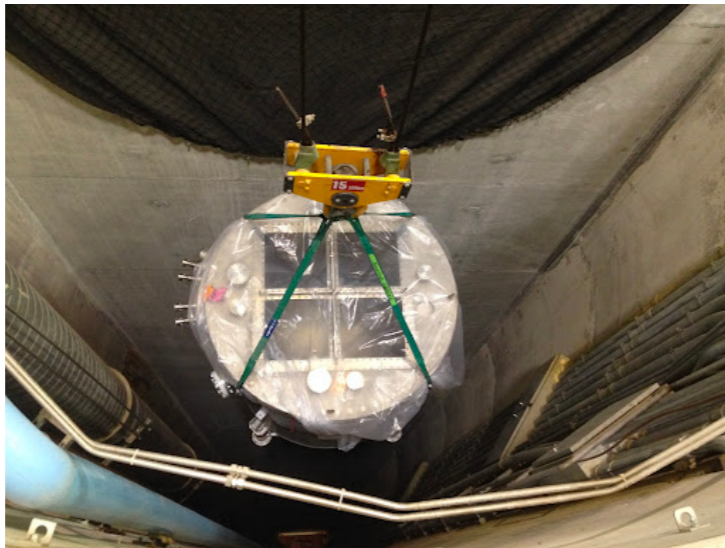


Our group's current focus:
**getting ready for data taking
with the 2x2+MINERvA
demonstrator**

- Four ND-LAr prototype modules in a single cryostat
- A forwards & backwards tracker made of repurposed MINERvA modules
- Exposed to the NuMI beam at Fermilab

2x2 + MINERvA: Current Status

- The MINERvA installation is already complete
 - We are already taking our first beam data!
- The installation of the 2x2 is ongoing:
 - Installation completion and commissioning this summer
 - Analysis chain must be functional by then!



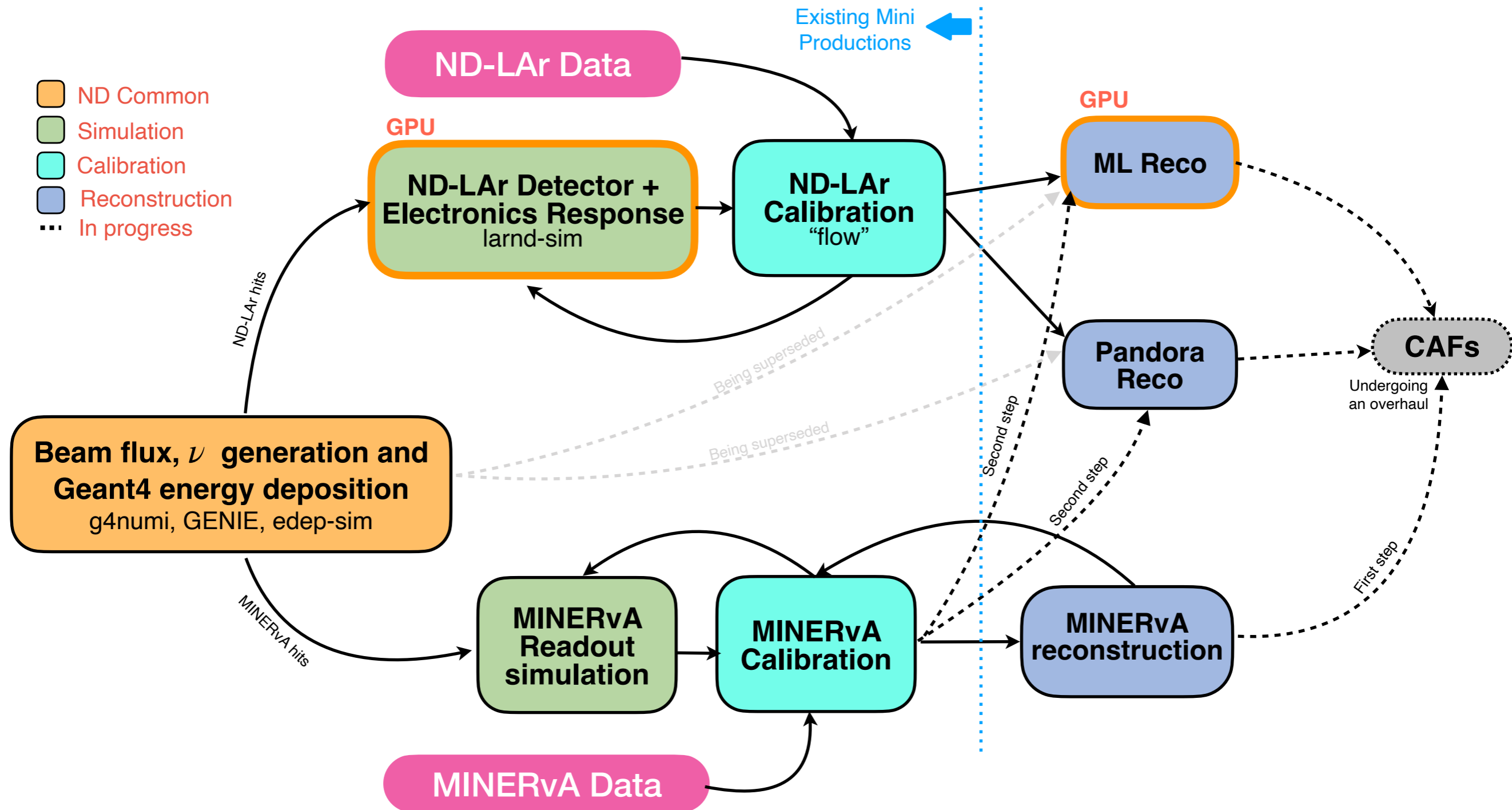
- Beam shutdown expected from early July until mid-October at the earliest
 - Beam will come back in Reverse Horn Current (RHC) mode until at least the next summer

Workshop Goals

- The 2x2 + MINERvA demonstrator offers unique opportunities:
 - Innovative LAr technology
 - High-intensity neutrino data
 - (Hopefully) long running span
- But also unique challenges:
 - Two detector systems with very different software & DAQ architecture
 - Big project in an even bigger experiment
 - Pressing timeline!
- Main goals of the workshop:
 - Come closer to inaugurating our full software chain
 - Plan a strategy to handle systematics
 - Zero in on first physics target(s)
 - Integrate newcomers to the effort!

The Obligatory Diagram: our Software Chain

- Complex infrastructure with many interfaces and interdependencies:



Glossary of Terms to Survive the Workshop

Term	Description
CAFs	“Common Analysis Files.” These are ROOT ntuples intended for high-level analysis
edep-sim	GEANT4 wrapper used to simulate particle energy depositions
flow (a.k.a. ndlar_flow)	Series of calibration routines applied to the LAr data (simulated or real)
larnd-sim	Detector simulation developed for pixelated LArTPCs
MiniRun	A small production sample (1e19 POT). So far MiniRuns have only been produced to the flow stage
ML reco	One of the two event reconstruction packages being developed for ND-LAr and the 2x2. Used in other experiments (e.g. ICARUS) but being adapted to our detectors
Pandora	One of the two event reconstruction packages being developed for ND-LAr and the 2x2. Used in other experiments/detectors (e.g. ProtoDUNE) but being adapted to work with 3D information of our detectors
reflow	The process of re-applying the flow calibration routines to data (simulated or real)
StandardRecord	The primary object holding the information in the CAFs. Its structure is in the process of being redesigned

(Let us know if you have any terms you'd like to see added)



ND Prototypes Analysis Structure

- We are lucky to have a highly dedicated team tackling all the different fronts!

ND Prototypes Analysis WG

LAr Simulation and Calibration
Yifan Chen
Kevin Wood

Reconstruction (Pandora)
Steve Dennis

Reconstruction (ML reco)
Francois Drielsma

Analysis Tools
Andrew Mogan
Andrew Cudd

Production
Matt Kramer

MINERvA
Alysia Marino
Tammy Walton

First Analysis
Saba Parsa
Brooke Russell

working closely with

ND CAF Task Force
Mat M. and Pedro O.

Joint effort between ND Prototypes and ND sim/reco WGs

- You can contact us and/or the subgroup leads if you want to get involved in these efforts

Workshop Logistics



Fermilab Access and Slack Channel

- Those of you who have access only as “business visitors” in principle need to be escorted while at Wilson Hall and the User’s Center
 - But you can go to the bathroom on your own!
- We have created a slack channel for the workshop:
[#nd_proto_workshop_may23](#)
 - We can discuss physics and/or any issues related to the logistics of the workshop there
 - In particular, if you have issues with Fermilab access that can be solved by being escorted, feel free to write there

*Many thanks to **Anne Norrick** and **Michele Weber**
for their help sorting out access issues*



Day #1

Production →

Geometry →

Simulation & Calibration

Tutorial on detector simulation & calibration files

See <https://indico.fnal.gov/event/59495/> for latest version of the agenda

A good amount of discussion time has been allocated after each talk

09:00	Introduction to the Workshop 1West	J. Pedro Ochoa et al. 09:00 - 09:20
	Production Status and Plans 1West	Matt Kramer 09:20 - 09:50
10:00	Geometry 1West	Alejandro Diaz et al. 09:50 - 10:10
	MINERvA Simulation Overview 1West	Noe Roy 10:10 - 10:30
	Group Photo and Coffee Break 1West	10:30 - 11:00
11:00	MINERvA Calibration Overview 1West	Carlos Pernas 11:00 - 11:15
	MINERvA DAQ and Nearline Status 1West	Alysia Marino 11:15 - 11:30
	LAr Simulation + Calibration Overview 1West	Kevin Wood et al. 11:30 - 12:00
12:00	Truth information roadmap in larndsim and ndlar_flow 1West	Andrew Cudd 12:00 - 12:15
	Beam window optimization 1West	12:15 - 12:30
	Lunch Break (fnal cafeteria on your own) 1West	12:30 - 13:30
13:00		
	The setup for 2x2 analysis and more 1West	Matt Kramer 13:30 - 14:15
14:00	An example of navigating through a ndlar_flow file 1West	Kevin Wood et al. 14:15 - 15:00
15:00	Extracting light information from larnd-sim 1West	Angela White 15:00 - 15:30
	Coffee Break 1West	15:30 - 16:00
16:00	Wine & Cheese Seminar 1West	16:00 - 17:00

Day #2

Reconstruction

09:00	MINERvA Reconstruction Overview	Noe Roy
1West		09:00 - 09:20
	MINERvA Offline Tasks	Tammy Walton
1West		09:20 - 09:30
	Pandora	Leigh Whitehead et al.
1West		09:30 - 10:00
10:00	ML reco	Andrew Mogan et al.
1West		10:00 - 10:30

Systematics

	Coffee Break	
1West		10:30 - 11:00
11:00	Systematics: Beam	Anthony Wood et al.
1West		11:00 - 11:30
	Systematics: Xsec	Jaesung Kim
1West		11:30 - 12:00
12:00	Systematics: Detector	Callum Wilkinson et al.
1West		12:00 - 12:30

See <https://indico.fnal.gov/event/59495/> for latest version of the agenda

A good amount of discussion time has been allocated after each talk

CAFs

	Lunch (on your own)	
1West		12:30 - 14:00
14:00	Overview of Changes to StandardRecord	Andrew Cudd et al.
1West		14:00 - 14:20
	Status of ML reco output to CAFs	Sindhujha Kumaran
1West		14:20 - 14:35
	Status of Pandora output to CAFs	Steve Dennis
1West		14:35 - 14:50
	Status of MINERvA output to CAFs	Noe Roy
1West		14:50 - 15:00

Potential Near Term Physics Targets

15:00	Coffee Break	
1West		15:00 - 15:30
	First analysis introduction	Brooke Russell et al.
1West		15:30 - 15:35
	Mesonless numubar CC cross-section	Elise Hinkle
1West		15:35 - 15:55
16:00	Charged track multiplicity	Afroditi Papadopoulou
1West		15:55 - 16:15
	Neutron physics at 2x2	Brooke Russell
1West		16:15 - 16:35
	MBq MeV-scale gamma sources	Fernanda Psihas Olmedo et al.
1West		16:35 - 16:55
17:00	Big Picture: Closeout	J. Pedro Ochoa, Zoya Vallari
1West		17:00 - 17:15



Coffee Breaks, Lunches, and Photo

- Friday May 19:
 - Coffee breaks and lunch on your own at Fermilab cafeteria
 - You are strongly recommended to order [online](#) to save time
- Saturday May 20:
 - Coffee breaks provided (**\$10 per person**)
 - Lunch on your own outside Fermilab (longer lunch break)
- Group photo today during the first coffee break!!
 - Please walk towards the main entrance of Wilson Hall as soon as we go out for the first coffee break today



← Photo from the previous workshop at the University of Bern

Social Dinner

- Will have a social dinner *tonight* starting at 6pm
 - At the Frontier Pub (User's Center)
 - **\$20 per person** for food
 - Drinks on your own, available there
 - We will be joined by some folks from ICARUS

*Many thanks to
Anne Norrick for
organizing!!*



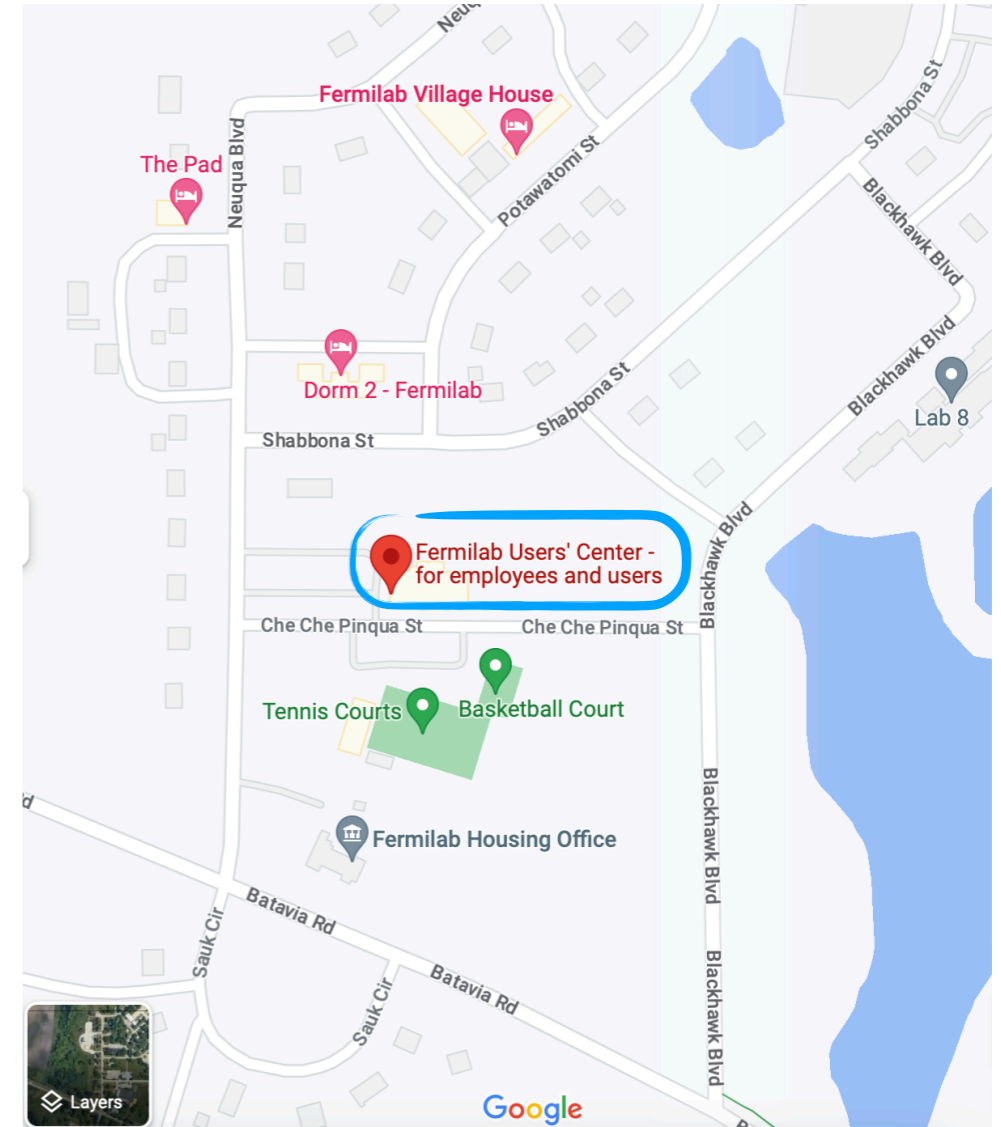
*Please RSVP in the
[#nd_proto_workshop_may23](#)
channel in slack by
answering the survey that
will be provided for this
purpose*

Directions to the User's Center



(view from the side)

Address: Che Che Pinqua Street, Batavia, IL



Go through the front door, and look for the room with tables and a big bison head on the wall

Your Homework

- Choose a payment method:
 - Fees for this workshop:
 - \$10 for Saturday's coffee breaks
 - \$20 for Friday's dinner (if applicable)
 - Two options to pay:
 - Cash to Zoya or Pedro
 - Venmo



We can give you a physical or electronic (preferred) receipt

Scan this code to pay

- RSVP for tonight's dinner:

- Reply to this poll in the [#nd_proto_workshop_may23](#) channel before the first coffee break

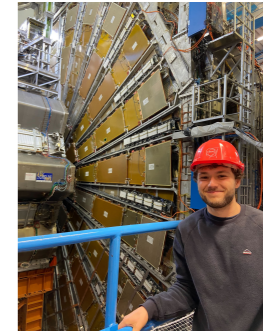
A screenshot of the Simple Poll APP interface. At the top left is a bar chart icon. The title is 'Simple Poll APP'. The question is 'Would you be joining us for Dinner at the Users' Center today (May 19th)?'. There are three response options, each with a corresponding number in a blue box: '1 Yes and I signed up for it in the registration', '2 Yes but I did not check the option in the registration', and '3 I would love to but I have other plans'. A three-dot menu icon is visible in the top right corner.

Social Program on Sunday

- Kevin Wood and Stephen Greenberg are organizing a social activity for Sunday
- Three options to choose from:
 - Kane County Cougars Baseball Game (minor league, close to Fermilab)
 - Laser Tag
 - Architecture river boat tour in Chicago



Kevin Wood



Stephen Greenberg

