



# Closing the 54<sup>th</sup> Annual Users (Virtual) Meeting

**Reddy Gandrajula and Sophie Middleton**  
2021 Users Meeting Chair and Deputy

**August 5<sup>th</sup>, 2021**



# 54<sup>th</sup> Fermilab Users (Virtual) Meeting

## New Horizons of Our Community

### August 2 - 6, 2021

Highlight leading-edge science, celebrate Fermilab's achievements and look to our future as a community

**Dynamic keynote address • Exciting talks • Future of HEP by Snowmass panel  
Fun virtual poster session • Conversations on equity, diversity and inclusion**

ALL community members (including non-Users) are welcome!  
Please register as soon as possible at:

<https://indico.fnal.gov/e/UAM2021>



# Thank you!

- We've had such a good time with you over the past few days!
- We hope with this virtual UM-2021, we accomplished in:
  - Bringing the community together (including employees, Users, young people etc. and make them all feel welcome)
  - Educate and train with experiment talks, Introductory-level talks, science communication, visas&immigration, Scientific careers: Paths and opportunities, Lab Resource Groups, Mental Health, keynote, Spotlight on the community, and tours
  - Foster collaboration (snowmass, networking)
  - Celebrate accomplishments (talks, awards, reports from UEC, Directorate, FSPA)
  - Have a good time (Virtual poster session, Celebrations, Festa Italiana)

# Special thanks to (by no means exhaustive)

- Nigel Lockyer, Hema Ramamoorthi, Kate Gregory, Luciano Ristori, Greg Bock, Kevin Pitts, Joe Lykken, Amber M Kenney
- All division/deputy heads, spokespeople and others who advised & helped find speakers
- Joy Pomillo, Melody Saperston and all admin members(Melissa Ormond, Kathryn A Duerr )
- Griselda Lopez, Kim Pearce
- Sandra Charles, Jimmy McLeod, Jeomar Montelon, Laura Rogas
- **ALL our speakers, session chairs, poster presenters, and panelists**
- Glen Crawford, James Shank
- Adrienne McCue, Cortez Watkins, Alyssa Miller, Lorena Lobato Pardavila, Richie Diurba, Yun He, Amanda Early
- Marcelle Soares-Santos
- Jean L Reising, Elizabeth Sexton, Jon A Bakken, Farha Bhimji, Dawn M. Staszak, Heath B O'Connell, Keenan Newton, Margherita Vittone
- Valery Stanley, Alexander Dgebuadze
- Valerie Higgins, Meredith Lee, Frederique Pellemoine, Leo Aliaga, Alyssa Miller, Erica Snider, Jeny Teheran
- Brian Beckford, Indara Suarez, Jamie Antonelli, Lia Meringa
- URA: Marta Cehelsky, Ted Wackler, Lourdes Garcia-Ruiz
- Joel Butler, Tao Han, Bob Bernstein, Anadi Canepa, Jim Hirschauer, Tim Tait, Brenna Flaughner, Aida El-Khadra, Pedro Machado, Vladimir Shiltsev, Petra Merkel, Oliver Gutsche, Breese Quinn, Sara Simon, Josh Barrow
- Lynn Johnson, Diana Brandonisio, Kurt Riesselmann, Justine Dunn, Leah Hesla, Deb Sebastian, Lauren Biron
- Donna Iraci, John Kent, Paul Ellison
- FSPA Officers: Anna Hall, Maria Martinez-Casales, Ohana B. Rodrigues, Zachary Williams, Zubair Ahmad Dar
- Marco Mambelli, Donatella Torretta

# Your 2020-2021 Users Executive Committee



Jonathan Asaadi



Ashley Back  
UEC Chair 2020/21



Reddy Pratap Gandrajula  
UM Chair, QoL, EPE



Ketino Kaadze  
GovRel Chair



Manolis Kargiantoulakis  
EPE Chair, UM



Sophie Middleton  
UM Deputy



Monica Nunes  
UM, EPE



Isobel Ojalvo



Alexx Perloff  
EPE Deputy, UM, QoL  
Secretary & Webmaster



Aleena Rafique  
QoL Deputy



Nadja Strobbe  
GovRel Deputy



Yuanyuan Zhang  
QoL Chair

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STEP UP FOR MENTAL HEALTH®

# Mental Health 101: Let's Talk About it!

Peer Support Advocacy



Thanks to Marcelle for an excellent Keynote speech and sharing an inspiring personal story!

1986

# FIRST NEW PHYSICS HORIZON

In Carajás, I learned my **first physics concept** during a field trip to the mine in preschool: propagation of waves.

It takes several seconds for the sound of an explosion to travel across that open-pit — *my mind was blown!*



Marcelle Soares-Santos ♦ University of Michigan ♦ @msoares\_santos ♦ 54th Fermilab Users Meeting ♦ Aug 04, 2021



Recording

Live Transcription (Closed Captioning) has been enabled Who can see this transcript? X

part of that group. Also, you know, working with a lot of students to do education programs and helping.

Unmute Start Video Participants Chat Share Screen Record Raise Hand Q&A Live Transcript More End

Live Transcription (Closed Captioning) has been enabled Who can see this transcript? X

# Tell me about the best talk you've ever seen.

Reddy Pratap Gandraju

Cortez Watkins

Yun He

Amanda Early (she/her)

Richie Durba

Becky Thompson (she/her)

Alex Perloff

Henry Glass

Vivek Jain

Gabriele Benelli (he, hi...

You are viewing Alexander Dighwadze's screen View Options

## Investigating Improvements to the NOvA Event Selection Efficiency for Events in the Mass-hierarchy-sensitive Energy Range

Cullen Sullivan, Mark Messler, Ashley Back

NOvA studies neutrinos with muon neutrino and antineutrino beams originating from Fermilab.

- Probes CP violation and measures neutrino parameters by observation of  $\nu_e$  appearance in  $\nu_\mu$  beams by oscillation
- NOvA is a mature experiment but still is statistics limited, motivating exploration of ways to increase sample sizes

Neutrinos oscillate between flavor states by propagating through mass states. The neutrino mass hierarchy, the ordering of mass states, can be measured by observing flux differences of  $\nu_e$  and  $\bar{\nu}_e$  appearances. This project probes quality checks for opportunities to allow new events to enter the experimental sample without compromising signal-to-background. Focus is on the energy range most sensitive to mass hierarchy.

Asymmetry Difference

With  $\Delta m_{21}^2 \approx 7.5 \times 10^{-5} \text{ eV}^2$ , the mass hierarchy produces an asymmetry in  $\nu_e$  and  $\bar{\nu}_e$  oscillation. The highest differences occurred at low energies, providing motivation for investigating reconstruction efficiencies there. Only a general energy range was desired, so just  $\nu_e$  and  $\bar{\nu}_e$  appearance frequencies were considered.

Work in progress

Preliminary results reveal useful signal at low energy,  $\nu_e$  events in this range fall quality checks because of an energy minimum of 1.0 GeV, enforced because of past poor reconstruction at low energy. With modern reconstruction, particle ID scores remain good at low energy, indicating early potential for safe signal gain by lowering the energy threshold.

A simulation lowered the threshold from 1.0 GeV to 0.8 GeV.

- Considerable increase in favorable signal (Event 2)
- Lower rank events tended to have lower particle IDs, so they were not included in the final sample (Event 3)
- Promise for new low energy signal, but results are signal-only
- No hard data on background effect has been gathered. Other effects of lowering the threshold are unclear

Future work for the project includes:

- Analysis of cosmic rejection and looking for other areas that could benefit from optimization
- A second pass of the workflow with:
  - A larger sample and focused preselection
  - Emphasis on background analysis and effects when including low energy  $\nu_e$  events

NOvA uses two detectors, one at Fermilab and one in northern MN, to make observations of neutrinos originating from Fermilab in order to measure neutrino parameters like the mass hierarchy.

Fermilab

U.S. DEPARTMENT OF ENERGY Office of Science

INDIANA UNIVERSITY BLOOMINGTON

Participants Chat Share Screen Record Reactions Leave

## Immigrant Visas or "Green Cards"

- Immigrant Visa - path to permanent residence (two- or three-step process)
- Options depend on job, employee's qualifications, employer's involvement
- Each case is analyzed individually to determine the best strategy

SOSTRIN

Reddy Pratap Gandraju

Alexander Dighwadze

Cullen Sullivan

Ohana Benedita Rodrigues

Ashley Back

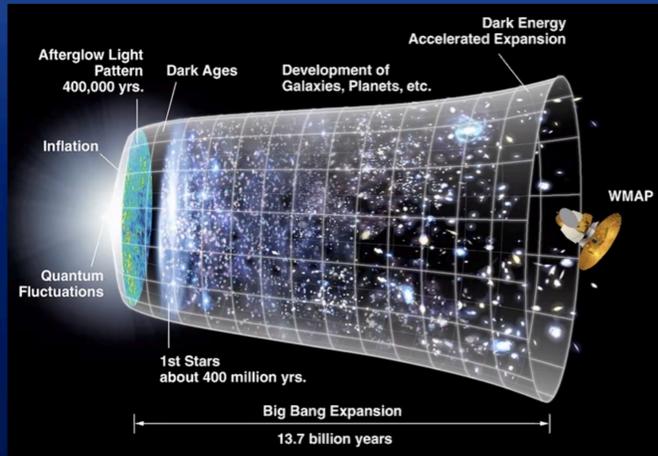
Valery Stanley

Ashley Back (he/him)

You are viewing Alexander Dighwadze's screen View Options

# $\Lambda$ CDM Cosmology

- Expanding, flat universe that began in a hot, dense state
- Dominated by dark energy and dark matter



NASA WMAP Science Team

- $\Lambda$ CDM model describes our universe incredibly well... BUT it leaves many fundamental questions unanswered

So just to review the model of our universe is the lambda CDN model of Cosmology, it says we live in expanding. Sara M. Simon

08/03/21

Zoom meeting interface showing a list of participants: Reddy Pratap Gandrajula, Sara Simon (she/her), Yuanyuan Zhang, Sophie Middleton, and Alexx Perloff.

Zoom meeting interface showing a video feed of e Yucel and a name tag for Anna Driutti.

Zoom meeting interface showing a list of participants: 85 total, 13 panelists, and 72 attendees.

## EM Calorimeter

- 1348 CsI crystals;
  - 3.4x3.4 cm surface area.
  - 20 cm in length.
- Readout by SiPMs.
- Annular design like tracker with hole in the middle.
- Distance between two disks = 70 cm;
  - half wavelength of electron's path.
- Provides;
  - Seed to complement tracking.
  - 0.5 ns time resolution.
  - particle ID, 10% energy resolution.
  - Position, 1 cm spatial resolution.

**• Prototype using 51 CsI crystals & 102 SiPMs**  
**• 5.4% at 100 MeV energy resolution**  
**• Timing resolution < 150 ps**

2 disk annular design with hole

Front end electronics

CsI crystals

Cooling

Entries/1 MeV

Bin	1100
Entries	26.59 / 27
$\chi^2 / \text{ndf}$	0.07021 / 0.04812
$\mu$	8.672 ± 0.202
$\sigma$	86.12 ± 3.38
N	1108 ± 33.8

tracking it as point five minutes second time resolution, and it makes part of particle identification, has 10% energy resolution.

Zoom meeting interface showing controls: Unmute, Start Video, Participants (85), Chat, Share Screen, Raise Hand, Q&A, More, and End.

Participants (85)

Panelists (13) Attendees (72)

Search

- AB Abraham Burleigh (Guest)
- AL Alessandra Lucà
- AM Andrew Mogan (Guest)
- AN Andrew Norman
- AC Anne Christensen (Guest)

Chat

What motivated you to become involved in EDI efforts at Fermilab?

How do your identities exist within your work?

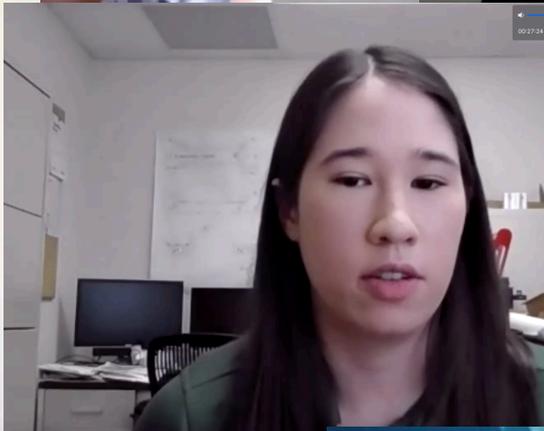
Cortez Watkins to Everyone 8:15 A

Who can see your messages? Recording On

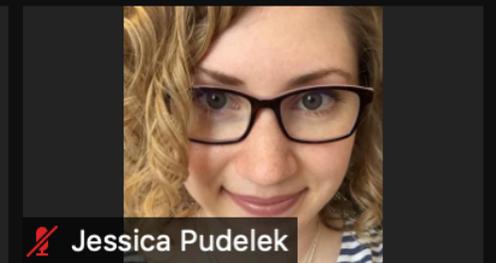
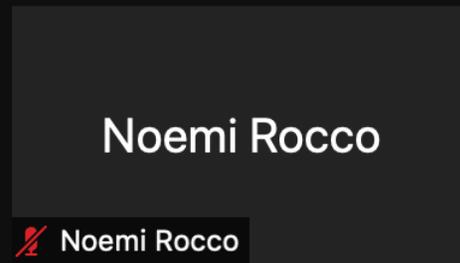
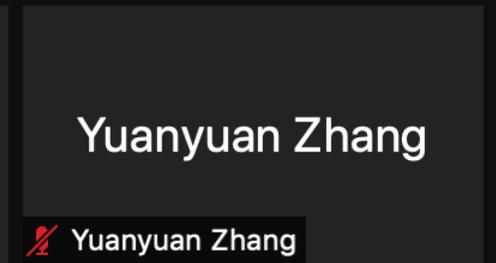
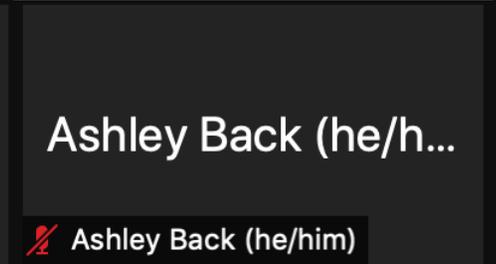
To: Creative... (Direct Message)

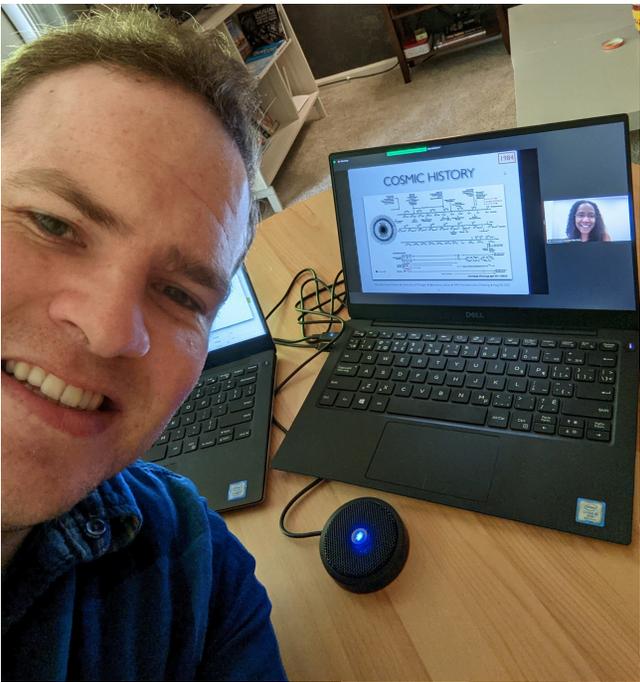
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# Lab Resources Groups panel



# Panel: Spotlight on the community





Recording

STERILE NEUTRINO EXPERIMENTS AT FERMILAB (ETW) 2

Recording

STERILE NEUTRINO EXPERIMENTS AT FERMILAB (ETW) 2

## OVERVIEW

- Introduction to neutrino oscillation, sterile neutrinos, and Fermilab neutrino experiments
- MiniBooNE\*
- MINOS+
- Short Baseline Neutrino Program:
  - MicroBooNE status
  - SBN sensitivity projections
  - SBND installation status
  - ICARUS commissioning status & analysis plans

Note: I am a collaborator on SBND and ICARUS, but not the other experiments. Thank you to A. Aurisano, T. Carroll, W. Louis, D. Mendez, W. Van De Pontseele, F. Varanini, and G. Zeller for providing slides/plots for this presentation!

Zoya Vallari (she/her)	Reddy Pratap Gandrajula	Wenjie Wu
Gonzalo Diaz	Creative Services	Sophie Middleton
Alexx Perloff	Joel Butler	Maria Martinez-Casales



Division of Particles & Fields

# Snowmass 2021: The Community Planning Exercise

Tao Han

University of Pittsburgh

On behalf of the Snowmass Steering Group



Tao Han @ Fermilab Annual Users Meeting

Zoya Vallari (she/her)	Reddy Pratap Gandrajula	Wenjie Wu	Manolis Kargiantoulakis
Maria Martinez-Casales	Zack Williams Zack Williams	Vladimir Shiltsev Vladimir Shiltsev	Han, Tao
Joshua Barrow	Creative Services	Sophie Middleton Sophie Middleton	Monica Nunes Monica Nunes
Ashley Back (he...) Ashley Back (he/him)	Petra Merkel	Brenna Flaughner Brenna Flaughner	Oliver Gutsche
Robert Bernstein	Joel Butler	Pedro Machado Pedro Machado	Alexx Perloff

# Winners of the Users Meeting Poster Session

- First Place: Zhuowen Zhang (University of Chicago)
- Second Place: Elkins, Miranda (Iowa State University)
- Third Place: Emrys Peets (Stanford University, SLAC)

- Award Certificates and prizes will be sent to you soon!
- Special thanks to all our judges: Anna Hall, Ohana B. Rodrigues, Maria Martinez-Casales, Zachary Williams, Zubair Ahmad Dar
- And to **Sophie Middleton and Jean L Reising** for the majority of the work in organizing the virtual posters session

## Thank you to our community

- You elected us to serve you, and it has been our pleasure to do so.
- Thank you to the Employees, Users, Contractors.
- Thank you for your attention and passion over the past few days. We've been so happy about the attendance and feedback.
- “New Horizons of Our Community” has been beautifully realized in all your talks, your presence, and your continued dedication to making our lab and our world a better place. Let's keep doing the work and striving toward a better future.

## Final Reminders

- Expert “excursions” virtual tours of LINAC accelerator/MINOS underground areas, Muon Campus areas and the Fermilab prairie. From 9:00 -11:00 am
- Festa Italiana tomorrow! Join us for an online pasta cooking class and social time! Link information will be emailed to all registrants. 4-7 PM classtime.

Festa Italiana is returning in its virtual form for a second year!

**Note: Need to buy some ingredients for Festa and prepare some things before the class**

Connect via zoom and join the fun.

We are delighted to welcome back “Al Dente - Pasta Artists” for a live cooking class.

Join ahead of time to introduce yourself and greet new and old Fermilab's friends

Stay after the class to show off your dish and to start dinner together.

- Send your pics to [um2020pics@gmail.com](mailto:um2020pics@gmail.com) : enjoying the meeting, or headshots for a collage of participants!
- Our UEC election will be soon, please consider joining us!

Stay healthy, stay safe and take care of each other.