57th Annual Users Meeting (2024): Inspirations from P5

Report of Contributions

Contribution ID: **1** Type: **not specified**

Welcome to Users Meeting

Presenters: CUMMINGS, Mary Anne (Muons, Inc.); CUMMINGS, Mary Anne (Cummings)

Session Classification: Session I

Contribution ID: **2** Type: **not specified**

Welcome & Director's Report

Presenter: MERMINGA, Lia (FNAL)

Session Classification: Session I

Contribution ID: **3** Type: **not specified**

Users Executive Committee Report

Presenters: NACHTMAN, Jane (University of Iowa); NACHTMAN, Jane

Session Classification: Session I

Contribution ID: **4** Type: **not specified**

Progress and Plans of the Site Access Steering Committee

Wednesday, 10 July 2024 09:15 (30 minutes)

Presenters: SHERIN, Brian (Fermilab); GLENZINSKI, Doug (Fermilab)

Session Classification: Session I

Contribution ID: **5** Type: **not specified**

Accelerator Complex Status & Evolution

Wednesday, 10 July 2024 09:45 (30 minutes)

Presenter: CRNKOVIC, Jason (Fermilab)

Session Classification: Session I

Contribution ID: **6** Type: **not specified**

Users Meeting Welcome

Wednesday, 10 July 2024 08:00 (10 minutes)

Presenter: CUMMINGS, Mary Anne (Cummings)

Session Classification: Session I

Contribution ID: **7** Type: **not specified**

Welcome & Director's Report

Wednesday, 10 July 2024 08:10 (50 minutes)

Presenter: MERMINGA, Lia (FNAL)

Session Classification: Session I

Contribution ID: **8** Type: **not specified**

Users Executive Committee Report & Name Update Discussion

Wednesday, 10 July 2024 09:00 (15 minutes)

Presenters: LYON, Adam (Fermilab); NACHTMAN, Jane

Session Classification: Session I

Contribution ID: **9** Type: **not specified**

Deep Underground Neutrino Experiment Overview

Wednesday, 10 July 2024 10:30 (40 minutes)

Presenter: OH, Sungbin (Fermilab)

Session Classification: Session II

Contribution ID: **10** Type: **not specified**

Short-Baseline Near Detector Program

Wednesday, 10 July 2024 11:10 (20 minutes)

Presenter: KALRA, Daisy (Student)

Session Classification: Session II

Contribution ID: **11** Type: **not specified**

What is the Fermilab SQMS Center?

Wednesday, 10 July 2024 11:30 (30 minutes)

Presenter: GRASSELLINO, Anna (Fermilab)

Session Classification: Session II

Contribution ID: **12** Type: **not specified**

Artificial Intelligence & Machine Learning

Wednesday, 10 July 2024 12:00 (30 minutes)

Presenter: GANDRAKOTA, Abhijith (Fermi National Accelerator Laboratory)

Session Classification: Session II

Contribution ID: **13** Type: **not specified**

Town Hall with the Directorate

Wednesday, 10 July 2024 13:30 (45 minutes)

Presenters: FLEMING, Bonnie (Fermilab); LOPEZ, Griselda (FNAL); GALVAN, John (Fermilab); MERMINGA, Lia (FNAL); CLAY, Marc (FNAL); CHARLES, Sandra (Fermilab)

Session Classification: Session III

Contribution ID: **14** Type: **not specified**

Discovery on the Prairie

Wednesday, 10 July 2024 14:15 (20 minutes)

Presenter: JARVIS, Jonathan (Fermilab)

Session Classification: Session III

Contribution ID: **15** Type: **not specified**

Visa Office Overview & Updates

Wednesday, 10 July 2024 14:45 (1 hour)

Session Classification: Session III

Contribution ID: **16** Type: **not specified**

UEC Quality of Life Subcommittee Report

Wednesday, 10 July 2024 14:35 (10 minutes)

Presenter: NORBERG, Scarlet (FNAL)

Session Classification: Session III

Contribution ID: **17** Type: **not specified**

UEC Education and Public Engagement Subcommittee Report

Wednesday, 10 July 2024 16:00 (15 minutes)

Presenter: YAEGGY, Barbara (University of Cincinnati)

Session Classification: Session IV

Contribution ID: **18** Type: **not specified**

Fermilab Sustainability Presentation

Wednesday, 10 July 2024 17:00 (45 minutes)

Presenter: HURLEY, Catherine (ISD-Engineering-Sustainability)

Session Classification: Session IV

Contribution ID: **19** Type: **not specified**

CMS/LHC Report

Thursday, 11 July 2024 08:15 (30 minutes)

Presenter: GOUSKOS, Loukas (Brown University)

Session Classification: Session V

Contribution ID: **20** Type: **not specified**

FCC Accelerator & Physics/Experiments/Detectors Report

Thursday, 11 July 2024 09:30 (45 minutes)

Presenters: PAUS, Christoph (MIT); POSEN, Sam (Fermilab)

Session Classification: Session V

Contribution ID: **21** Type: **not specified**

Scientific Computing (CSAID) Report

Thursday, 11 July 2024 09:00 (30 minutes)

Presenter: SEHRISH, Saba (Fermilab)

Session Classification: Session V

Contribution ID: **22** Type: **not specified**

Fermilab Quantum Institute (FQI)

Thursday, 11 July 2024 08:45 (15 minutes)

Presenter: LYKKEN, Joseph (Fermilab)

Session Classification: Session V

Contribution ID: **23** Type: **not specified**

User & Affiliate Fellowship Support Programs

Thursday, 11 July 2024 10:30 (10 minutes)

Presenter: PALEY, Jonathan (Fermilab)

Session Classification: Session VI

Contribution ID: **24** Type: **not specified**

URA Honorary Awards Ceremony

Thursday, 11 July 2024 10:40 (10 minutes)

Presenters: ROSADO-REYES, Claudette (Universitites Research Association); MESTER, John (URA)

Session Classification: Session VI

Contribution ID: **25** Type: **not specified**

URA Doctoral Thesis Award

Thursday, 11 July 2024 11:00 (10 minutes)

Presenter: MACCOY, Brynn (University of Washington)

Session Classification: Session VI

Contribution ID: **26** Type: **not specified**

URA Early Career Award

Thursday, 11 July 2024 11:10 (10 minutes)

Presenter: PEDRO, Kevin (Fermilab)

Session Classification: Session VI

Contribution ID: **27** Type: **not specified**

URA Tollestrup Award

Thursday, 11 July 2024 10:50 (10 minutes)

Presenter: BOTTI, Ana Martina

Session Classification: Session VI

Contribution ID: **28** Type: **not specified**

URA Engineering Award

Thursday, 11 July 2024 11:20 (10 minutes)

Presenter: PELLICO, William (FNAL)

Session Classification: Session VI

Contribution ID: **29** Type: **not specified**

SpinQuest/E1039 Report

Thursday, 11 July 2024 11:30 (20 minutes)

Presenter: LAVRUKHIN, Ievgen (University of Michigan)

Session Classification: Session VI

Contribution ID: **30** Type: **not specified**

IOTA Report

Thursday, 11 July 2024 11:50 (20 minutes)

Presenter: WALLBANK, Michael (Fermilab)

Session Classification: Session VI

Contribution ID: **31** Type: **not specified**

ANNIE Report

Thursday, 11 July 2024 12:10 (20 minutes)

Presenter: WEINSTEIN, Amanda (Iowa State Univ.)

Session Classification: Session VI

Contribution ID: **32** Type: **not specified**

PIP-II Overview & Update

Thursday, 11 July 2024 13:30 (40 minutes)

Presenter: RAIMONDI, Pantaleo (Fermilab)

Session Classification: Session VII

Contribution ID: **33** Type: **not specified**

ICARUS Report

Thursday, 11 July 2024 14:10 (20 minutes)

Presenter: MOONEY, Michael (Colorado State University)

Session Classification: Session VII

Contribution ID: **34** Type: **not specified**

Astrophysics - Dark Matter Report

Thursday, 11 July 2024 14:30 (20 minutes)

Presenter: UEMURA, Sho

Session Classification: Session VII

Contribution ID: **35** Type: **not specified**

Astrophysics Overview & CMBS4 Report

Thursday, 11 July 2024 14:50 (20 minutes)

Presenter: SONNENSCHEIN, Andrew (Fermilab)

Session Classification: Session VII

Contribution ID: **36** Type: **not specified**

APS-TD Magnet Research & Development

Thursday, 11 July 2024 15:10 (20 minutes)

Presenter: KASHIKHIN, Vadim (Fermilab)

Session Classification: Session VII

Contribution ID: **37** Type: **not specified**

Fermilab Student & Postdoc Association Overview

Thursday, 11 July 2024 15:30 (15 minutes)

Presenters: POPHALE, Ishanee (Lancaster University); BALCEWICZ, Michael (Fermilab)

Session Classification: Session VII

Contribution ID: **38** Type: **not specified**

MicroBooNE Report

Thursday, 11 July 2024 16:00 (20 minutes)

Presenter: BERKMAN, Sophie (Michigan State University)

Session Classification: Session VIII

Contribution ID: **39** Type: **not specified**

NOvA Report

Thursday, 11 July 2024 16:20 (20 minutes)

Presenter: MESSIER, Mark (Indiana University)

Session Classification: Session VIII

Contribution ID: **40** Type: **not specified**

g-2 Report

Thursday, 11 July 2024 16:40 (20 minutes)

Presenter: KIM, On (University of Mississippi)

Session Classification: Session VIII

Contribution ID: **41** Type: **not specified**

Mu2e (+PIP-II Muon Possibilities)

Thursday, 11 July 2024 17:00 (20 minutes)

Presenter: Mr BAUTISTA, Gonzalo Diaz

Session Classification: Session VIII

Contribution ID: **42** Type: **not specified**

MAGIS-100

Thursday, 11 July 2024 17:20 (20 minutes)

Presenter: TEMPLES, Dylan (Fermilab)

Session Classification: Session VIII

Contribution ID: **43** Type: **not specified**

MINERvA Results Report

Thursday, 11 July 2024 17:40 (20 minutes)

Presenter: HARRIS, Deborah (York University and Fermilab)

Session Classification: Session VIII

Contribution ID: **44** Type: **not specified**

UEC Government Relations Subcommittee Report

Friday, 12 July 2024 08:30 (15 minutes)

Presenters: YU, David; PEDRO, Kevin (Fermilab)

Session Classification: Session IX

Contribution ID: **45** Type: **not specified**

Special Address: Congressman Bill Foster

Friday, 12 July 2024 08:45 (1 hour)

Presenter: FOSTER, Congressman Bill

Session Classification: Session IX

Contribution ID: **46** Type: **not specified**

Department of Energy Future Outlook

Friday, 12 July 2024 09:45 (30 minutes)

Presenter: RAMEIKA, Regina (Department of Energy)

Session Classification: Session IX

Contribution ID: **47** Type: **not specified**

Muon Collider at Fermilab

Friday, 12 July 2024 10:30 (45 minutes)

Presenter: NEUFFER, David (Fermilab)

Session Classification: Session X

Contribution ID: **48** Type: **not specified**

Connecting Theory and Experiment through Event Simulation

Friday, 12 July 2024 11:15 (35 minutes)

Presenter: HOECHE, Stefan (Fermilab)

Session Classification: Session X

Contribution ID: **49** Type: **not specified**

Closing Remarks

Friday, 12 July 2024 11:50 (10 minutes)

Presenter: SINGH, Prabhjot (Queen Mary University of London, UK)

Session Classification: Session X

Contribution ID: **50** Type: **not specified**

Closing Remarks

Presenter: SINGH, Prabhjot (Queen Mary University of London, UK)

Session Classification: Session X

Contribution ID: **51** Type: **not specified**

Special Colloquium: From Inspirations to Futures

Friday, 12 July 2024 16:00 (1 hour)

Presenter: QUIGG, Chris (Fermilab)

Session Classification: Special Colloquium

Contribution ID: **52** Type: **not specified**

Efficiency Analysis of ML-Based Anomaly Detection Triggers for Emerging Jets

Novel machine learning-based anomaly detection Level 1 (L1) triggers are currently under development at CMS, namely AXOL1TL and CICADA. The former employs a variational autoencoder, while the latter utilizes a convolutional autoencoder. These triggers aim to balance rate reduction with model independence, enabling the selection of potentially significant events that might be overlooked by traditional triggers relying on basic kinematic variable selections. Consequently, they have the potential to enhance signals indicative of physics beyond the Standard Model, such as those associated with emerging jets. Such signals are predicted by models featuring a composite dark sector where long-lived particles decay into Standard Model jets with displaced tracks and numerous vertices. This study evaluates the efficiency of these anomaly detection triggers in selecting events with emerging jets produced via the s-channel production of two dark quarks.

Primary author: CRUZ, Roy (University of Puerto Rico Mayagüez)

Presenter: CRUZ, Roy (University of Puerto Rico Mayagüez)

Session Classification: Poster Session

Contribution ID: **54** Type: **not specified**

Test Beam Results of Planar Pixel Sensor for the CMS Phase 2 Inner Tracker Upgrade

Results of the test beam measurements that characterize the performance of CMS Readout Chip (CROC) sensors to be used in the High Luminosity era of the Large Hadron Collider (HL-LHC) are presented. The HL-LHC peak instantaneous luminosity of 7.5×10^{34} cm$^{-2}s^{-1}$ corresponds to an average of around 200 inelastic proton-proton collisions per beam-crossing every 25 ns. In order to efficiently reconstruct and track particles in these extreme and challenging conditions, the present CMS tracking detector will be completely replaced. The new tracking detector consists of an Inner Tracker closest to the beamline and an Outer Tracker surrounding it. These are populated with modules constructed of readout chips and silicon sensors. The test beam measurements of these modules are vital to understand the performance of the related technologies. Using a primary 120 GeV proton beam from the Main Injector at Fermilab, data was collected at the Fermilab Test Beam Facility (FTBF) using the silicon tracker telescope that provides a precision position measurement of the track impact point with less than 5 micron uncertainty. The proton beam was incident on a 1x2 planar CROC module with sensor developed by Hamamatsu. The sensor has 100x25 μm^2 standard pixels and also a smaller number of 225x25 μm^2 longer pixels at the boundary between the two ROCs. We present characterisation of these modules that includes pixel efficiency, resolution, cluster size and charge distributions.

Primary author: Dr SHARMA, Richa (University of Puerto Rico, Mayaguez)

Presenter: Dr SHARMA, Richa (University of Puerto Rico, Mayaguez)

Session Classification: Poster Session

Contribution ID: **55** Type: **not specified**

FCC Update #2 (TBD)

Session Classification: Session IV

Contribution ID: **56** Type: **not specified**

Search For Low-Mass Quark-Antiquark Resonances Produced With an Initial State Photon at 13 TeV Using the CMS Detector

We present a search for low-mass narrow $q\bar{q}$ resonances. This search uses data from LHC pp collisions at a center of mass of 13 TeV in Run 2, and corresponds to an integrated luminosity of 137 fb-1, currently using 10% of data. Utilizing full Run 2 data allows the use of a lower photon pT threshold trigger than a previous analysis performed with only 2016 data, allowing this analysis to be more sensitive to resonances in the low mass region. We require an initial state photon recoiling against the narrow resonance, leading to the resonance having a high transverse momentum. The high pT decay products of the resonance collimate and are reconstructed as a single large jet with an internal two-pronged substructure. A two-pronged dijet score based on the ParticleNet tagger is used to select jets with two-pronged substructure. The background is estimated via a data-driven method using a transfer factor between the distributions which fail and pass the two-pronged substructure requirement. The new physics signal is searched for as a narrow peak excess above the Standard Model backgrounds in the jet mass spectrum.

Primary authors: KOBERT, Adam (Rutgers, The State University of New Jersey); HALKIADAKIS, Eva (Rutgers University)

Presenter: KOBERT, Adam (Rutgers, The State University of New Jersey)

Session Classification: Poster Session

Contribution ID: **57** Type: **not specified**

Fermilab Efforts in EDI & STEM

Wednesday, 10 July 2024 16:15 (45 minutes)

Presenter: WALLACE, Richard (Accelerator Directorate)

Session Classification: Session IV

Contribution ID: **58** Type: **not specified**

Predicting Missing Regions of Charged Particle Tracks Using a Sparse 3D Convolutional Neural Network

This study explores the use of a Sparse 3D Convolutional Neural Network (ConvNet) to infer missing regions of charged particle tracks. Hits corresponding to energy depositions are voxelized into a three-dimensional (3D) grid for each track. Inactive regions within the tracks are replaced with a dense, rectangular 3D grid of voxels, ensuring consistent step sizes in X, Y, and Z directions. Voxels in these dense regions are initialized with an energy value of -1, indicating nonphysical energy or charge. The model is trained to predict which voxels should activate as part of the track and which should not. Results indicate that the model accurately predicts track voxels within ±1 unit in X, Y, or Z directions and effectively identifies non-track voxels, despite some overprediction. The approach shows promise in prediction of missing track regions with some accuracy.

Primary author: UTAEGBULAM, Hilary (University of Rochester)

Presenter: UTAEGBULAM, Hilary (University of Rochester)

Session Classification: Poster Session

Contribution ID: **59** Type: **not specified**

Reconstruction of the BNB and NuMI Neutrino Bunch Structure with ICARUS

ICARUS serves as the Far Detector of the Short Baseline Neutrino (SBN) program at Fermilab, sitting on-axis on the Booster Neutrino Beam (BNB) and 6° off-axis from the Neutrinos at the Main Injector (NuMI) beam. Neutrinos from both beams inherit the timing sub-structure of their parent proton spills, which is in turn derived from either the Booster's or the Main Injector's synchrotron acceleration. Since neutrino propagation introduces only a constant offset, their timing structure is preserved as they travel. Identifying this structure in data represents a powerful tool for selecting neutrino events and searching for physics beyond the Standard Model (BSM). This poster presents the preliminary reconstruction of the BNB and NuMI neutrino bunch structure with ICARUS data, exploiting only the precise timing of ICARUS optical readout system to both locate and assign a time to each interaction.

Primary author: VICENZI, Matteo (BNL)

Presenter: VICENZI, Matteo (BNL)

Session Classification: Poster Session

Contribution ID: **60** Type: **not specified**

Performance analysis of phase 2 Tracker upgrade Ps Module before and after irradiation

The Large Hadron Collider will undergo a luminosity upgrade targeting a peak instantaneous luminosity ranging from 5 up to $7.5\times10^{34}\text{cm}^{-2}\text{s}^{-1}$. The ambitious goal of the High Luminosity LHC is to achieve a total of 3000-4000fb^{-1} of proton-proton collisions at a center-of-mass energy of 14TeV.
To cope with such challenging environmental conditions, the outer tracker of the CMS experiment will be upgraded using closely spaced silicon sensors (pixels and strips) to provide tracking information at the Level-1 trigger. A PS-Module, composed of both a pixel and a strip sensor, was tested at the Fermilab Test-Beam Facility to evaluate its ability to provide accurate tracking information, particle momentum discrimination capabilities and optimal performance at the irradiation levels expected after being exposed to the harsh conditions of the High Luminosity LHC. The results of the test and the comparison of the module performance before and after irradiation will be presented in this poster.

Primary author: SOHAIL, Iqra (National Center For Physics Islamabad, Pakistan)

Presenter: SOHAIL, Iqra (National Center For Physics Islamabad, Pakistan)

Session Classification: Poster Session

Contribution ID: **61** Type: **not specified**

LDMX: The Light Dark Matter eXperiment

The constituents of dark matter are still unknown, and the viable possibilities span a very large mass range. Specific scenarios for the origin of dark matter sharpen the focus to within about an MeV to 100 TeV. Most of the stable constituents of known matter have masses in this lower range, and a thermal origin for dark matter works in a simple and predictive manner in this mass range as well. If there is an interaction between light DM and ordinary matter, as there must be in the case of a thermal origin, then there necessarily is a production mechanism in accelerator-based experiments. The Light Dark Matter eXperiment (LDMX) is a planned electron-beam fixed-target missing-momentum experiment at SLAC that has unique sensitivity to light DM in the sub-GeV mass range. Although optimized for a missing momentum technique, LDMX is effectively a fully instrumented beam dump experiment, making it possible to search for visibly decaying signatures of dark sector particles. This would provide another outlet for LDMX to probe complementary regions of dark matter phase space for a variety of models. This contribution will give an overview of the theoretical motivation for LDMX, the main experimental challenges and how they are addressed, as well as projected sensitivities in comparison to other experiments.

Primary author: HOROHO, Tyler (University of Virginia)

Presenter: HOROHO, Tyler (University of Virginia)

Session Classification: Poster Session

Contribution ID: **62** Type: **not specified**

Mu2e: Modeling Drift of Ionized Particles with ML

The Mu2e experiment searches for charged lepton flavor violation through muon-to-electron conversion in the field of a nucleus. The signal is a monoenergetic electron with an energy of 104.97 MeV. Its momentum is reconstructed using information from drifting ionized particles. This project analyzes the drift of ionized particles with a deep neural network to help improve the momentum reconstruction process. The model yields a 20% improvement in resolution from a reference linear model.

Primary authors: Mr NGUYEN, Hien (University of California, Berkeley); BONVENTRE, Richard (Lawrence Berkeley National Lab); KOLOMENSKY, Yury (LBNL)

Presenter: Mr NGUYEN, Hien (University of California, Berkeley)

Session Classification: Poster Session

Contribution ID: **63** Type: **not specified**

High-throughput Custom Monitoring for the Mu2e TDAQ System

In this project we are studying the application of programmable network hardware to provide a custom monitoring capability for the Mu2e Trigger and Data Acquisition System (TDAQ) system. The goal of the Mu2e experiment is to search for a charged-lepton flavor violating processes where a negative muon converts into an electron in the field of an aluminum nucleus. This experiment is intended to improve by four orders of magnitude the search sensitivity reached so far.

We have a working prototype of a system that provides high-throughput, custom monitoring for the Mu2e TDAQ system. The custom Mu2e network packet header format is parsed as it crosses the network switch. Parsing extracts bits that convey information about error states at read-out controllers (ROCs). This information is periodically relayed to the switch controller, which in turn alerts experiment operators.

Future work includes: (1) generalizing the prototype to support the detection of other error or performance conditions, and (2) runtime reconfiguration of the TDAQ system as a response to detecting such conditions. This reconfiguration would be used to mitigate error or performance conditions.

Primary authors: KOWALKOWSKI, Jim (Fermilab); WANG, Michael H L (Fermilab); SHYAMKUMAR, Nishanth (Illinois Institute of Technology); CUMMINGS, Sean (Illinois Institute of Technology); SULTANA, Nik (Illinois Institute of Technology); RIVERA, Ryan (FNAL)

Presenter: SULTANA, Nik (Illinois Institute of Technology)

Session Classification: Poster Session

Contribution ID: **64** Type: **not specified**

First Measurements of Differential Cross Sections In Kinematic Imbalance Variables With The MicroBooNE Detector

Making high-precision measurements of neutrino oscillation parameters requires an unprecedented understanding of neutrino-nucleus scattering. In this presentation, we present the first muon neutrino charged current double-differential cross sections in kinematic imbalance variables. These variables characterize the imbalance in the plane transverse to an incoming neutrino. We use events with a single muon above 100 MeV/c, a single final state proton above 300 MeV/c, and no recorded final state pions. Thus, these variables act as a direct probe of nuclear effects such as final state interactions, Fermi motion, and multi-nucleon processes. We also present a complementary ongoing analysis using electron neutrinos. This channel is of the utmost importance for the extraction of neutrino oscillation parameters by making high-precision measurements. Our measurements allow us to constrain systematic uncertainties associated with neutrino oscillation results performed by near-future experiments of the Short Baseline Neutrino (SBN) program, as well as by future large-scale experiments like DUNE.

Primary authors: MOUDGALYA, Maitreyee (The University of Manchester); ON BEHALF OF THE MICROBOONE COLLABORATION

Presenter: MOUDGALYA, Maitreyee (The University of Manchester)

Session Classification: Poster Session

Contribution ID: **65** Type: **not specified**

MLOps for Beam Controls

Machine learning operations (MLOps) is the standardization and streamlining of the ML development lifecycle to address the challenges associated with large-scale machine learning applications. The full MLOps pipeline consists of open-source tools: DataHub, MinIO and MLflow. It is being used for dataset management and model development to handle changing data dependencies, varying business needs, reproducibility, and diverse teams working with differing tools and skills. To demonstrate the completion of an MLOps pipeline for particle accelerator operations, we are deploying a simple script that computes settings for the Booster's gradient magnet power supply. Once the demonstration is complete, we will develop and deploy ML-based optimization algorithms to improve Booster's overall efficiency. This MLOps pipeline opens the gate to systematically develop and deploy ML applications for accelerator controls and diagnostics.

Primary author: BHARDWAJ, Gopika (Fermilab)

Presenter: BHARDWAJ, Gopika (Fermilab)

Session Classification: Poster Session

Contribution ID: **66** Type: **not specified**

The CMS Phase 2 Outer Tracker Analyzer of Test Outputs - POTATO!

The Phase-2 upgrade of the Large Hadron Collider (LHC), also known as the High-Luminosity LHC (HL-LHC) is designed to achieve peak instantaneous luminosities which is about an order of magnitude higher than the nominal design value of $10^{34}\ cm^{-2}s^{-1}$ delivering a total of at least $3000 fb^{-1}$ data over 10 years of operation at $\sqrt{s}\ =\ 14\ TeV$. One crucial aspect of the CMS Phase-2 detector upgrade is the replacement of the existing tracking detector in order to deal with the extreme HL-LHC conditions, retaining and further expanding the physics performances achieved in the previous years. The outer part of the upgraded tracker (OT), will be equipped with over 13,000 macro Pixel-Strip (PS) and Strip-Strip (2S) modules! Module production is distributed across centers worldwide and necessitates coordinated efforts and standardized procedures. Along with production and assembly of the modules, Fermilab OT group is also working on a tool, Phase 2 Outer Tracker Analyzer of Test Outputs (POTATO) that will analyze, grade, upload and manage the large quantity of files to be stored in the centralized Database (DB). In this contribution a brief overview of the module testing and the power and dire need of POTATO to handle this large number of test outputs will be presented.

Primary author: BARADIA, Sweta

Presenter: BARADIA, Sweta

Session Classification: Poster Session

Contribution ID: **67** Type: **not specified**

Constructing Data-Driven Predictions at the Far Detector for NOvA's Neutrino Oscillation Analysis

NOvA, is a two-detector, long-baseline neutrino oscillation experiment located at Fermilab, Batavia, IL, USA. It is designed primarily to constrain neutrino oscillation parameters using ν_μ ($\bar{\nu}_\mu$) disappearance and ν_e ($\bar{\nu}_e$) appearance data. The Neutrinos at Main Injector (NuMI) beamline at Fermilab provides a high purity 900 KW intense beam of neutrinos and anti-neutrinos to NOvA. The NOvA Near Detector, located 100m underground and 1km away from the beam source, observes the un-oscillated ν_μ ($\bar{\nu}_\mu$) and beam ν_e ($\bar{\nu}_e$) event spectrum. The Far Detector, located in Ash River, MN, USA, is 809 km from the ND and records the oscillated ν_e ($\bar{\nu}_e$) and the un-oscillated ν_μ ($\bar{\nu}_\mu$) event spectrum. NOvA uses a data-driven technique called extrapolation to predict the expected number of ν_μ ($\bar{\nu}_\mu$) and ν_e ($\bar{\nu}_e$) events at the Far Detector using the Near Detector data. The use of data from a functionally equivalent Near Detector provides a powerful constraint on the systematic uncertainties in NOvA neutrino oscillation analyses. As NOvA continues to add data statistics, a robust constraint on systematics becomes more crucial for neutrino oscillation analysis. The details of the NOvA neutrino oscillation analysis framework and how it constrains dominant systematic uncertainties using the Near Detector data will be discussed in this poster.

Primary authors: Prof. CHOUDHARY, Brajesh (University of Delhi); Mr SINGH, Ishwar (University of Delhi); Dr SUTER, Louise (Fermi National Accelerator Laboratory)

Presenter: Mr SINGH, Ishwar (University of Delhi)

Session Classification: Poster Session

Contribution ID: **68** Type: **not specified**

Charged current single pion production on SBND

The Short Baseline Neutrino (SBN) program at Fermilab is designed to provide precise measurements of neutrino oscillations using 3 Liquid Argon Time Projection Chambers (LArTPC) built along Fermilab's Booster Neutrino Beam (BNB). The Short Baseline Near Detector (SBND), located at only 110 m from the BNB target, will precisely characterize the neutrino flux before oscillations take place, thanks to its unprecedented neutrino interaction statistics.
Due to its proximity to the neutrino production target, the detector expects over a million neutrino interactions annually, which will open the possibility of exploring exclusive channels of neutrino interactions.
This poster will show SBND's capabilities of exploring Muon Neutrino Charged Current Single Pion production, for which previous measurements in Argon were limited by statistics. The poster will introduce the relevance of this process for neutrino Physics, the unique possibilities of SBND and a preliminary event selection using SBND's current reconstruction tools.

Primary author: PELEGRINA GUTIÉRREZ, Luis (Universidad de Granada)

Presenter: PELEGRINA GUTIÉRREZ, Luis (Universidad de Granada)

Session Classification: Poster Session

Contribution ID: **70** Type: **not specified**

Population-level Dark Energy Constraints from Strong Gravitational Lensing using Simulation-Based Inference

In this work, we present a scalable approach for inferring the dark energy equation-of-state parameter (w) from a population of strong gravitational lens images using Simulation-Based Inference (SBI). Strong gravitational lensing offers crucial insights into cosmology, but traditional Monte Carlo methods for cosmological inference are computationally prohibitive and inadequate for processing the thousands of lenses anticipated from future cosmic surveys. New tools for inference, such as SBI using Neural Ratio Estimation (NRE), address this challenge effectively. By training a machine learning model on simulated data of strong lenses, we can learn the likelihood-to-evidence ratio for robust inference. Our scalable approach enables more constrained population-level inference of w compared to individual lens analysis, constraining w to within 1σ. Our model can be used to provide cosmological constraints from forthcoming strong lens surveys, such as the 4MOST Strong Lensing Spectroscopic Legacy Survey (4SLSLS), which is expected to observe 10,000 strong lenses.

Primary author: JARUGULA, Sreevani (Fermilab)

Co-authors: NORD, Brian (Fermilab); GANDRAKOTA, Abhijith (Fermi National Accelerator Laboratory); CIPRIJANOVIC, Aleksandra (Fermi National Accelerator Laboratory)

Presenter: JARUGULA, Sreevani (Fermilab)

Session Classification: Poster Session

Contribution ID: **71** Type: **not specified**

Study of the Neutrino Magnetic Moment with the NOvA Near Detector

Predicted by the Standard Model as theoretical, massless particles, neutrinos have been the subject of many experiments since their first detection. It is now experimentally confirmed that neutrinos do have mass necessitating an extension to the Standard Model. Such an extension allows for other surprising neutrino properties, such as a neutrino magnetic moment. While neutrinos are observed to be neutral and do not couple to photons at leading order, higher order expansion of the interaction allows for coupling to the photon to occur and gives rise to a neutrino magnetic moment through quantum loop effects. This is a useful property for studying the Dirac or Majorana nature of neutrinos, as the predicted value of the magnetic moment would differ. This talk focuses on an introduction to the neutrino magnetic moment as well as discusses the current status of work being done on NOνA utilizing the Near Detector to obtain an upper limit on the neutrino magnetic moment value.

Primary author: CHOATE, Sarah (University of Iowa)

Presenter: CHOATE, Sarah (University of Iowa)

Session Classification: Poster Session

Contribution ID: **72** Type: **not specified**

Road to PROSPECT-II

The Precision Reactor Oscillation and SPECTrum (PROSPECT) experiment is based in a segmented liquid scintillator antineutrino detector situated approximately 7 meters from the highly enriched High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory. Its main goal is to investigate short-baseline antineutrino oscillations.

The first phase of data collection, known as PROSPECT-I, was held from 2018 to 2019 and was used for several high-precision analyses, including multiple measurements of the ^{235}U antineutrino spectrum and searches for eV-scale sterile antineutrino oscillations.

The collaboration is now preparing for the second phase, PROSPECT-II, which features an upgraded detector design. This advancement will enhance sensitivity and statistical power, allowing for a broader range of analyses beyond those achieved in PROSPECT-I. As we transition into this new phase, new questions have arisen concerning background simulation and its potential differences from those conducted during the initial phase of the experiment. Moreover, it is essential to ascertain, through simulations, the positive effects that an improved detector could have on the study of oscillations. This information is crucial for justifying the proposed enhancements, and I will present all of this in the poster.

Primary author: MACHADO, Franz (Illinois Institute of Technology)

Presenter: MACHADO, Franz (Illinois Institute of Technology)

Session Classification: Poster Session

Contribution ID: **73** Type: **not specified**

Demonstrating MeV-Scale Physics Capabilities of Large Neutrino LArTPCs with Ambient Blip Activity in MicroBooNE

Large neutrino liquid argon time projection chamber (LArTPC) experiments can broaden their physics reach by incorporating isolated MeV-scale features present in their data. We use data from MicroBooNE, an 85-tonnes LArTPC exposed to Fermilab neutrino beams from 2015 until 2021, to demonstrate new calorimetric and particle discrimination capabilities for isolated ~O(1 MeV) energy depositions referred to as "blips". We observe concentrations of blips near fiberglass support struts along the TPC edge, with an energy spectrum indicative of specific gamma-ray decays. These and other blip sources are being used to validate calibrations in MicroBooNE's data by leveraging spectral features. This work further reports on the progress towards distinguishing between low-energy protons and electrons in large LArTPCs using cosmogenic data. The composition of proton-like blips selected using this new technique is being studied to evaluate the accuracy of cosmic ray flux models used in LArTPCs.

Primary author: ANDRADE, Diego (Illinois Institute of Technology)

Presenter: ANDRADE, Diego (Illinois Institute of Technology)

Session Classification: Poster Session

Contribution ID: **74** Type: **not specified**

Industrial Applications via Novel Compact Electron Beam Accelerator

Electron beam (e-beam) technology provides an efficient, safe and environmentally friendly way to drive chemical reactions. E-beam technology is used in a vast array of industries and common consumer products, with sales eclipsing $2B annually, providing an estimated added value to products of more than $\$\$500 B every year worldwide.

The main processes initiated by electron beam are polymer modification by crosslinking or scission, curing of coatings, decomposition of industrial effluents, or synthesis of new substances. Accelerator technology has applications in water and biosolids treatment, cargo scanning, material modification using electron beams, medical sterilization (X-ray and electron beam), industrial electron-beam driven chemistry, advanced manufacturing, environmental remediation and food sterilization. However, implementation of e-beam technology has been fairly slow due to general lack of knowledge of the technology. Also, applications of conventional e-beam accelerators currently available on the market are limited because they are not energy efficient, take up a large footprint and can be complicated to use and maintain.

Primary author: GRDANOVSKA, Slavica

Presenter: GRDANOVSKA, Slavica

Session Classification: Poster Session

Contribution ID: **75** Type: **not specified**

Impact of HF-CRPA CCQE model on the latest NOvA results

NOvA is a long-baseline neutrino experiment based at Fermilab, dedicated to measuring various neutrino oscillation parameters. Recently, the NOvA collaboration presented new results at NEUTRINO 2024. A significant enhancement in the modeling of charged-current quasielastic (CCQE) interactions has been achieved with the implementation of the Hartree-Fock (HF) mean-field model, incorporating continuum random phase approximation (CRPA) corrections. This HF-CRPA model offers substantial improvements in the low-energy region. In this presentation, I will discuss the impact of the HF-CRPA model on the latest three-flavor oscillation results of the NOvA experiment.

Primary author: PAL, Amit (National Institute of Scientific Education and Research (NISER))

Co-authors: RAMSON, Bryan; Prof. SWAIN, Sanjay (NISER)

Presenter: PAL, Amit (National Institute of Scientific Education and Research (NISER))

Session Classification: Poster Session

Contribution ID: **76** Type: **not specified**

ML-based Reconstruction in a Pixelated LArTPC:

The Deep Underground Neutrino Experiment (DUNE) will address open issues in neutrino physics such as the measurement of the CP-violating phase in neutrino oscillations and the neutrino mass ordering. The 2x2 demonstrator is a single-phase liquid argon time projection chamber (LArTPC), with four modules, operated as a prototype for the DUNE Liquid Argon Near Detector (ND-LAr). Each module in the 2x2 demonstrator is 0.67m x 0.67m x 1.8m. Based on the ArgonCube design concept, the 2x2 features a novel pixelated charge readout and advanced high-coverage photon detection system. Machine learning can be used to form a complete reconstruction pipeline for 2x2 events. This poster will describe the workings of a package under development called SPLINE and its current performance.

Primary author: NEOGI, Orgho

Presenter: NEOGI, Orgho

Session Classification: Poster Session

Contribution ID: **77** Type: **not specified**

W+D Charm Jet Fragmentation

Using ATLAS Run 2 data, proton-proton collisions at 13 TeV center of mass energy are analyzed to measure the properties of charmed particle fragmentation. The process $pp \rightarrow W \pm c$, where the c-quark fragments to a $^{+}$ hadron is used. Since quarks are not directly seen from the collision, a jet of particles containing the charmed hadron is used. This is accomplished by comparing the distribution of z_T, the ratio of the transverse momentum of the $^{+}$ to that of the track jet containing the hadron, to several Monte Carlo generators.

Primary author: LYNCH, Alec (Univer)

Presenter: LYNCH, Alec (Univer)

Session Classification: Poster Session

Contribution ID: **78** Type: **not specified**

MuSTAR - An accelerator-driven subcritical reactor

The Mu*STAR Nuclear Power Plant (NPP) is a transfor- mational and disruptive concept using advances in super- conducting accelerator technology to consume the fertile content in spent nuclear fuel (SNF) from light water reac- tors (LWRs) and to eliminte need for uranium enrichment.

Primary author: JOHNSON, Rolland (Muons, Inc.)

Co-authors: CUMMINGS, Mary Anne (Cummings); ABRAMS, Robert (Muons, Inc.); KAHN, Stephen (Muons Inc); ROBERTS, Thomas

Presenter: JOHNSON, Rolland (Muons, Inc.)

Session Classification: Poster Session

Contribution ID: **79** Type: **not specified**

Unveiling Sea Quark Dynamics: Measuring Sivers Asymmetry with Polarized Target at SpinQuest

SpinQuest is a cutting-edge, high-luminosity Drell-Yan experiment utilizing polarized hydrogen and deuterium targets to measure the Sivers asymmetry for the light sea quarks in the nucleon. Detecting a nonzero Sivers asymmetry would provide clear evidence for nonzero orbital angular momentum of sea quarks. The Sivers asymmetry presents itself as an azimuthal asymmetry in the production of virtual photons via the Drell-Yan process, and SpinQuest will be able to measure this asymmetry using the existing SeaQuest dimuon spectrometer. In addition to making measurements sensitive to the sea quark Sivers function, we will also measure the azimuthal asymmetry in the production of J/ψ particles, which is sensitive to the gluon Sivers function. Additionally, observing a sign change in the Sivers asymmetry between this measurement and future measurements at the Electron-Ion Collider would be a test of a fundamental prediction of Quantum Chromodynamics. In this poster we will review the physics and technology underpinning the experiment. This work was supported in part by US DOE grant DE-FG02-94ER40847.

Primary author: KURUPPU, Chatura (New Mexico State University)

Presenter: KURUPPU, Chatura (New Mexico State University)

Session Classification: Poster Session

Contribution ID: **80** Type: **not specified**

Single and double differential charged current \bm{ν_μ}–Argon cross section without pions in the final state at MicroBooNE

MicroBooNE, an 85-tonne liquid argon time projection chamber (LArTPC) detector is on-axis to the Booster Neutrino Beam (BNB) beamline facility at Fermi National Accelerator Laboratory. MicroBooNE is elucidating neutrino interactions with argon through cross-section measurements to refine interaction models and reduce uncertainties. In this poster, we present the status of the single and double multi-differential charged current (CC) cross section with zero pions in the final state (CC-0π) as a function of muon momentum ($0.1 < p_\mu < 2.0\,\mathrm{GeV/c}$) and the cosine of the muon angle ($-1 < \cos\theta_\mu < 1$). We present the details of the event selection and cross section extraction along with a set of tests using fake data to establish the robustness of the analysis methodology. We also discuss prospects for a future combined measurement with the Gd-H_2O target at the ANNIE experiment, to explore MicroBooNE's proton multiplicity alongside ANNIE's neutron multiplicity.

Primary authors: Prof. MASTBAUM, Andrew (Rutgers University); NGUYEN, Christian; Mr ENGLEZOS, Panagiotis (Rutgers University)

Presenter: NGUYEN, Christian

Session Classification: Poster Session

Contribution ID: **81** Type: **not specified**

A 3D field response simulation for pixelated charge readout in LArTPC

The Deep Underground Neutrino Experiment (DUNE) is a next-generation long-baseline neutrino oscillation experiment. A critical component of the DUNE Near Detector (ND) is a Liquid Argon Time Projection Chamber (LArTPC), called ND-LAr. A novel pixelated charge readout technology, LArPix, has been developed for LArTPCs. We present a new 3D field response simulation for these pixelated anode designs used in the Module-0 Demonstrator, which is operated as a 600kg prototype for the DUNE ND-LAr. The field response model describes the electric currents induced in the anode planes when ionization electrons drift in the chamber. Field response is important for TPC readout simulation and charge reconstruction. In the prototype detector cosmic-ray run, evidence of LArPix retriggering by induced signal has been noticed. Thus, this field response simulation is also crucial in understanding electronic response and optimizing anode geometry to reduce the retrigger effect.

Primary author: YANG, Jiangmei (Hong Kong University of Science and Technology)

Presenter: YANG, Jiangmei (Hong Kong University of Science and Technology)

Contribution ID: **82** Type: **not specified**

Calibrating LArPix for TinyTPC

LArTPCs provide sensitivity to GeV signals, such as accelerator neutrinos and part of the supernova neutrino spectrum. TinyTPC is a LArTPC test stand for R&D of LAr doping to expand the reach of LArTPCs down to the 1-10 MeV range, which would substantially enhance the flagship analyses of experiments like DUNE, while enabling low energy analyses. We aim to dope LAr with Xe and photosensitive dopants to expand the LArTPC range by converting hard-to-detect scintillation light to efficiently-detected ionization charge. A critical element of the data analysis in TinyTPC is calibrating the readout. This poster will cover the calibration of TinyTPC, a pixelated liquid argon detector, where we find the distance a muon travels through each pixel. We then calculate the energy loss of muons traveling through the detector from cosmic data. We can reconstruct the path of the particles through the TPC using a density-based clustering algorithm designed to sort straight cosmic muon tracks from low energy radioactive decay curled paths and electronic noise.

Primary authors: PSIHAS OLMEDO, Fernanda (Fermi National Accelerator Laboratory); LEMOINE, Hannah; MCCRIGHT, Hannah (University of Maryland); ZENNAMO, Joseph (Fermilab)

Presenters: LEMOINE, Hannah; MCCRIGHT, Hannah (University of Maryland)

Session Classification: Poster Session

Contribution ID: **83** Type: **not specified**

TinyTPC: A Test Stand for LAr Doping

TinyTPC is a small scale liquid-argon time projection chamber (LArTPC) featuring a pixelated readout system (LArPix) designed to improve the detection of charged particles. To enhance energy measurements at MeV scales, TinyTPC will study the impact of isobutylene, a photosensitive dopant that converts light to charge, and xenon, a wavelength shifter. This presentation will detail TinyTPC's commissioning, operation, data collection methodologies, noise levels, and upcoming tests involving isobutylene, xenon, and radioactive sources.

Primary authors: PSIHAS OLMEDO, Fernanda (Fermi National Accelerator Laboratory); ZENNAMO, Joseph (Fermilab); RODRIGUEZ THORNE, Paloma; GONZALEZ, Rebecca; MCCRIGHT, Hannah (University of Maryland); LEMOINE, Hannah

Presenters: RODRIGUEZ THORNE, Paloma; GONZALEZ, Rebecca; MCCRIGHT, Hannah (University of Maryland)

Session Classification: Poster Session

Contribution ID: **84** Type: **not specified**

Doped LAr as a Platform for Low-Energy Physics

LArTPCs are the technology of choice for many current and future neutrino experiments. Improving the performance of LArTPCs to signals with energies less than 10 MeV would substantially enhance the flagship analyses of experiments like DUNE, while potentially enabling the physics of solar neutrinos, dark matter searches, and neutrinoless double beta decay searches.
I outline the pathway and progress on R&D for photosensitive dopants, whose introduction into the LAr active medium has a potential to enable the detection of low-energy signals in large LArTPCs. This R&D program will demonstrate the feasibility and impacts of introducing doped LAr into current and future neutrino detectors at the kTon scale. I explain the impact of this technology on physics signals across energy ranges. I also introduce our ongoing tests of this technology in the TinyTPC test-stand at Fermilab.

Primary author: PSIHAS OLMEDO, Fernanda (Fermi National Accelerator Laboratory)

Presenter: PSIHAS OLMEDO, Fernanda (Fermi National Accelerator Laboratory)

Session Classification: Poster Session

Contribution ID: **85** Type: **not specified**

Constraining Systematics for Future Sterile Neutrino Analysis at NOvA Experiment

Equipped with detectors at both Fermilab in Illinois and Ash River in Minnesota, the NOvA experiment is designed to explore the complex properties of neutrinos, with a primary focus on the active three-flavor neutrino mixing phenomena. The experiment consists of two identical detectors: the Near Detector, situated 1 km underground at Fermilab, and the Far Detector, located 810 km away and 14 mrad off the beam axis in northern Minnesota. NOvA uses this significant distance to examine neutrino behaviour thoroughly.

Beyond investigating active neutrino mixing, NOvA also explores exotic oscillations, such as those involving sterile neutrinos. However, uncertainties in neutrino flux, cross-section, and detector systematics present significant challenges, making distinguishing genuine physics events from background noise difficult. This poster will discuss the approach to reduce the cross-section and flux systematics for the upcoming sterile neutrino analysis.

Primary authors: NORRICK, Anne; CHAUDHARY, SHIVAM (IIT Guwahati); BHUYAN, Bipul; Ms HAEJUN OH, Stella (University of Cincinnati)

Presenter: CHAUDHARY, SHIVAM (IIT Guwahati)

Contribution ID: **86** Type: **not specified**

Status of ICARUS NuMI interaction cross-section analyses

The ICARUS experiment, utilizing Liquid Argon Time Projection Chamber (LAr TPC) technology, has been installed at Fermilab, following its initial operation in Italy and subsequent refurbishment at CERN. ICARUS has successfully been taking physics data at Fermilab since June 2022. While the experiment's primary objective is to function as the far detector of the Short Baseline Neutrino program (SBN), searching for hints of physics beyond three-flavour PMNS neutrino oscillations, ICARUS also offers other diverse physics capabilities, including searches beyond the standard model and measurements of cross-sections. In addition to being exposed to the common Booster Neutrino (BNB) beamline of the SBN experiment, ICARUS receives neutrinos from the Main Injector (NuMI) beam. Due to the off-axis angle between NuMI and ICARUS, coupled with contributions from both pion and kaon decays to neutrino fluxes, interactions of NuMI neutrinos within ICARUS can be detected over a range of several GeV in energy. Measurements of these interactions present unqiue opportunities to infer neutrino interaction cross sections on an argon nuclear target within an energy range that overlaps both the SBN oscillation search and a signficnat portion of the DUNE spectrum. This poster will summarize the current status of ICARUS' muon-neutrino cross-section measurements, highlighting our first analysis where the signal is defined by events with no pions produced in the final state of the interaction and correlations between an outgoing lepton and proton are measured.

Primary authors: HOWARD, Bruce; BETANCOURT, Minerba (Fermilab); MORENO, Guadalupe; SMEDLEY, Jack; ROY, Promita; KIM, jaesung.kim.3426@gmail.com

Presenter: SMEDLEY, Jack

Contribution ID: **87** Type: **not specified**

Search for a Long-Lived ⊠ Resonance at ICARUS in SBN

The ICARUS detector in the SBN program at Fermilab is sensitive to “long-lived” new physics particles that would be produced in the Neutrinos at the Main Injector (NuMI) beam and decay inside the ICARUS liquid argon time projection chamber (LArTPC). We show results from a new analysis in ICARUS which searched for a long-lived particle produced in kaon decay which decays to two muons. The search is performed with an exposure of 2.41e20 protons on target in the NuMI beam. It is sensitive to new areas of parameter space for the Higgs portal scalar and an axion-like particle model. The sensitivity is also presented in a model-independent way applicable to any new physics model predicting the process $K \longrightarrow \pi + S(\longrightarrow \mu\mu)$, for a long-lived particle S. This is the first search for new physics performed with the ICARUS detector at Fermilab. It paves the way for the future program of long-lived particle searches at ICARUS.

Primary author: PUTNAM, Gray

Presenter: PUTNAM, Gray

Contribution ID: **88** Type: **not specified**

Evaluating the Effects of Detector Modeling Uncertainties on Sterile Neutrino Oscillation Sensitivities with the ICARUS Detector

The ICARUS T600 LArTPC detector was refurbished after an initial run at
the underground LNGS labs and is currently taking data within its experimental hall at Fermilab after full commissioning. Regular data taking began in May 2021 with neutrinos from the Booster Neutrino Beam (BNB) and the Neutrinos at the Main Injector (NuMI) off-axis beam. As the far detector of the Short-Baseline Neutrino (SBN) Program, the ICARUS detector's capability in searching for both muon neutrino disappearance and electron neutrino appearance will allow for unprecedented sensitivity to light sterile neutrinos with eV-scale mass. The ultimate sensitivity of the detector to sterile neutrino oscillations depends on the understanding of the detector response and the uncertainties remaining after calibrating the detector model. This poster will review how detector-model-related uncertainties are quantified, evaluated and their impact on expected sterile neutrino oscillation sensitivities using the existing ICARUS data. The work pursued here is broadly applicable to other ICARUS analysis pathways such as neutrino-argon cross-sections and Beyond the Standard Model physics searches. It will finally discuss improvement pathways to reduce the systematic uncertainties to the level needed for the joint sterile neutrino oscillation analysis with the Short Baseline Near Detector (SBND) within the SBN Program.

Primary author: ZETTLEMOYER, Jacob (Fermilab)

Presenter: ZETTLEMOYER, Jacob (Fermilab)