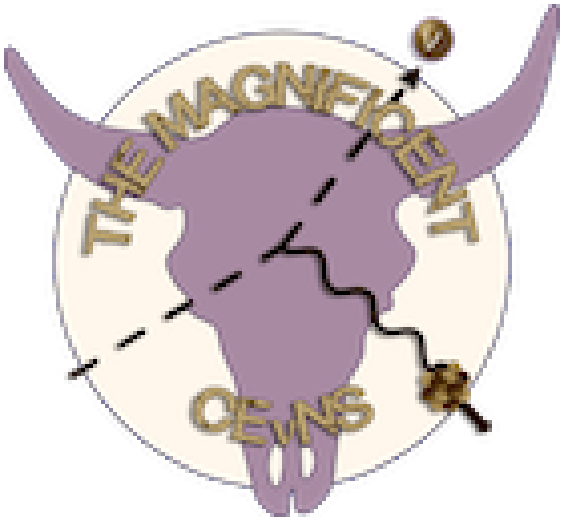
Magnificent CEvNS 2025



Report of Contributions

https://indico.cern.ch/e/m7s2025

Contribution ID: **1** Type: **Talk**

Readout, Monitoring, and Calibration of the Heavy Water Cherenkov detector system in the COHERENT experiment

The COHERENT experiment at the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory consists of several detectors designed to measure coherent elastic neutrino nucleus scattering from a pion-decay-at-rest neutrino source. A significant source of uncertainty in these results is the 10% estimated uncertainty in the neutrino flux from the SNS target. To reduce this uncertainty to 2-3%, we deployed a two-module Cherenkov detector system at the SNS. The first module contains heavy water as the neutrino target, whereas the second module uses light water. This talk will provide an overview of the detectors, discuss the readout and monitoring system, and describe the calibration process using a low-intensity light source.

Author: Dr SUBEDI, Tulasi (Concord University)

Presenter: Dr SUBEDI, Tulasi (Concord University)

Contribution ID: **2** Type: **Talk**

Results, Status and Perspectives of CONUS+

Tuesday 10 June 2025 11:30 (20 minutes)

The talk will cover latest results of the CONUS+ experiment. In addition the current status, an outlook and the physics perspectives will be covered.

Author: Prof. LINDNER, Manfred (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany)

Presenter: Prof. LINDNER, Manfred (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany)

Session Classification: Experiments 4

Contribution ID: **3** Type: **Talk**

Nuclear recoil detection with color centers in bulk lithium fluoride

Monday 9 June 2025 16:00 (18 minutes)

We present initial results on nuclear recoil detection based on the fluorescence of color centers created by nuclear recoils in lithium fluoride. We use gamma rays, fast and thermal neutrons, and study the difference in responses they induce, showing that this type of detector is rather insensitive to gamma rays. We use light-sheet fluorescence microscopy to image nuclear recoil tracks from fast and thermal neutron interactions deep inside a cubic-centimeter sized crystal and demonstrate automated feature extraction in three dimensions using machine learning tools. The number, size, and topology of the events agree with expectations based on simulation with TRIM. These results constitute the first step towards 10-1000g scale detectors with single-event sensitivity for applications such as the detection of dark matter particles, reactor neutrinos, and neutrons.

Author: HUBER, Patrick

Presenter: HUBER, Patrick

Session Classification: Experiments 3

Contribution ID: **4** Type: **Talk**

Implementing a CEvNS-based Supernova Neutrino Signal Trigger in the LUX-ZEPLIN Experiment

Tuesday 10 June 2025 16:44 (18 minutes)

The LUX-ZEPLIN (LZ) experiment is a low-threshold, low-background dark matter detector deployed 4850 feet underground at the Sanford Underground Research Facility in Lead, South Dakota, USA. The primary detector volume is a time projection chamber (TPC) containing 7 tonnes of liquid xenon. CEvNS interactions in this volume deposit O(1) keV of energy, a regime to which LZ is sensitive. Via CEvNS, LZ will be able to observe the neutrino signal from the next galactic core-collapse supernovae (CCSN). We demonstrate LZ's sensitivity to CEvNS interactions from a CCSN and discuss how the detector response is modeled.

LZ utilizes a custom data acquisition system (DAQ) based on the Kintex-7 Field Programmable Gate Array (FPGA) from Xilinx. We discuss the role of the DAQ in LZ's search for the CCSN neutrino signal, and show how a real time DAQ trigger on the neutrino signal will be implemented.

Author: MCCARTHY, Morgan

Presenter: MCCARTHY, Morgan

Session Classification: Experiments 5

Contribution ID: **5** Type: **Talk**

A measurement of the Solar Boron-8 Neutrino Fog with XENONnT

Tuesday 10 June 2025 16:00 (18 minutes)

Solar neutrinos interacting with nuclei in dark matter detectors through coherent elastic neutrino-nucleus scattering (CEvNS), often referred to as the 'neutrino fog,' presents a significant challenge to direct DM detection efforts. The XENONnT detector, known for its large exposure and low background, offers an exceptional opportunity to investigate this interaction. Utilizing data from XENONnT's first and second science runs, we searched for CEvNS signals of solar B-8 neutrinos, resulting in 37 observed events above 0.5 keV, with the 26.4 background events expected, led to the rejection of the background-only hypothesis with a statistical significance of 2.73-sigma. This marks the first direct detection of nuclear recoils from solar neutrinos using a dark matter detector. In this talk, I will present a detailed view of the search for solar B-8 CEvNS and a first search for light dark matter signals in neutrino fog.

Authors: Mr XU, Dacheng (Columbia University); Prof. GAO, Fei (Tsinghua University)

Presenter: Mr XU, Dacheng (Columbia University)

Session Classification: Experiments 5

Contribution ID: **6** Type: **Talk**

RELICS: A liquid xenon time projection chamber for CEvNS detection

Wednesday 11 June 2025 10:06 (18 minutes)

The neutrino-nucleus coherent scattering (CEνNS), known as CEνNS, has the largest cross-section among all interaction channels for MeV neutrinos, making it the most promising way to remotely monitor nuclear reactors. A precise determination of the CEvNS cross section has a significant impact on understanding the properties of neutrinos and constraining new physics beyond the standard model. Liquid xenon time projection chamber (LXeTPC) is one of the most promising technologies for CEvNS search, thanks to its well-established low background and energy threshold. The RELICS (REactor neutrino LIquid xenon Coherent Scattering experiment) experiment aims at reactor CEvNS detection using an LXeTPC. In this talk, I will introduce the RELICS experiment with a focus on its status and discovery potential for CEvNS signals from reactor neutrinos.

Authors: Prof. GAO, Fei (Tsinghua University); LI, Shengchao (Westlake University)

Presenter: LI, Shengchao (Westlake University)

Session Classification: Experiments 6

Contribution ID: **7** Type: **Talk**

BULLKID: searching for rare events with monolithic arrays of detectors

Monday 9 June 2025 12:06 (18 minutes)

BULLKID is a novel detector concept based on an array of particle absorbers sensed by multiplexed Kinetic Inductance Detectors (KIDs). The aim of this detector is to control the backgrounds by creating a fully active structure and by applying fiducialization techniques.

Following the encouraging results from a 20 g prototype detector, here we present the first operation of 3-wafer demonstrator array (for a total of 60 g and 180 silicon dice), operated on surface with a mild shield. The recorded background is here compared with Geant4 simulations conducted by the collaboration.

Currently, the collaboration is focused on building BULLKID-DM, a new experiment aimed at searching for hypothetical WIMP-like Dark-Matter particles with mass around 1 GeV or below and cross-section with nucleons smaller than 10^{-41} cm^2. The target of the BULLKID-DM experiment consists of a stack of BULLKID detectors and will amount to a total of 800˜g subdivided in more than 2000 silicon dice.

Aside from BULLKID-DM, there is also an ongoing R\&D aimed at transferring this detector technology to a germanium substrate. Changing to a higher nuclear mass target is imperative for a possible CEνNS experiment based on the BULLKID detector concept. Due to the initial promising results on this experimental effort, studies of the potential of a germanium-based BULLKID array are being made and will be here presented.

Finally, we present the foreseen timeline and commissioning of the BULLKID-DM experiment, which will be deployed in the Gran Sasso national laboratories.

Author: DEL CASTELLO, Giorgio (Istituto Nazionale di Fisica Nucleare (Italy))

Presenter: DEL CASTELLO, Giorgio (Istituto Nazionale di Fisica Nucleare (Italy))

Session Classification: Experiments 2

Contribution ID: **8** Type: **Talk**

The RES-NOVA astroaprticle physics observatory

Tuesday 10 June 2025 17:06 (18 minutes)

Core-collapse Supernovae (SN) release nearly all their binding energy as neutrinos. RES-NOVA tackles a major challenge in astroparticle physics by introducing a novel detection approach using cryogenic detectors made from ultra-pure archaeological lead (Pb). The innovation lies in exploiting Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), which offers a cross-section ~10^4 times larger than conventional channels.

The compact (30 cm)^3 detector array provides exceptional sensitivity, capable of surveying ~90% of galactic SNe. The ultra-low-radioactivity Pb enables low energy thresholds and minimal background, allowing precise measurement of SN neutrinos independent of flavor oscillations.

This technology extends beyond SN neutrino detection, offering promising applications in solar neutrinos studies, Dark Matter searches, and axion investigations. We will present recent experimental progress, including first prototype results and sensitivity projections. RES-NOVA marks a key step toward a new generation of neutrino and dark matter observatories.

Author: PATTAVINA, Luca (UNIMIB & INFN)

Presenter: PATTAVINA, Luca (UNIMIB & INFN)

Session Classification: Experiments 5

Contribution ID: **9** Type: **Talk**

Status and latest results of the nuGeN experiment

Tuesday 10 June 2025 11:55 (18 minutes)

The νGeN experiment is aimed to studying neutrino properties in the close vicinity of the reactor core of the Kalinin Nuclear Power Plant (KNPP) at Udomlya, Russia. The experimental setup is installed under reactor unit #3 of KNPP at the moving platform, which allows changing the distance from the center of the 3.1 GW_{th} core from 11.1 to 12.2 m. In this way, we obtain an enormous antineutrino flux of (3.6-4.4)x10^{13} $\nu/cm^2/s$. Materials of the reactor surrounding provide about 50 m w.e. overburden, which serves as a good shielding against cosmic radiation. In combination with a low ambient background, it gives us a unique opportunity to investigate antineutrino properties at the best experimental location in the world. To detect signals from the neutrino scattering, we use a high-purity, low-threshold germanium detector surrounded by passive and active shielding. A specially developed acquisition system allows suppressing events that correspond to noise. The current status of the experimental setup, data taking, and results will be presented.

Author: LUBASHEVSKIY, Alexey (JINR)

Presenter: LUBASHEVSKIY, Alexey (JINR)

Session Classification: Experiments 4

Contribution ID: **10** Type: **Talk**

Ionization Efficiency for pure crystals at low energies

Wednesday 11 June 2025 11:59 (18 minutes)

Understanding ionization efficiency at energies below 1 keV, both in pure crystals and in noble liquid detectors, provides an essential analytical tool for accurate measurements of Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) and the processes involved in the search for dark matter. This presentation will address theoretical concepts related to the Lindhard integral equation and the stopping power of electrons and nuclei. We will present a comprehensive and rigorous framework for verifying the validity of recent measurements of low-energy ionization efficiency in crystals, such as germanium and silicon. In addition, we will briefly explore new models for the stopping power of nuclei based on WKB calculations and compare them to the classical LSS model approach. The incorporation of dielectronic processes (Bates-Griffing) into electronic stopping power will also be discussed. When contrasted with recent experimental data, our findings reveal deviations from traditional assumptions, questioning established extrapolations and underscoring the need for more robust calibration methods and analytical tools, especially for crystals

Author: SARKIS MOBARAK, Youssef (ICN-UNAM)

Co-authors: Dr AGUILAR-AREVALO, Alexis (Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México); D'OLIVO, JUAN CARLOS (INSTITUTO DE CIENCIAS NUCLEARES, UNAM)

Presenter: SARKIS MOBARAK, Youssef (ICN-UNAM)

Session Classification: Phenomenology 4

Contribution ID: **11** Type: **Talk**

RICOCHET experiment: status and prospects

Monday 9 June 2025 11:44 (18 minutes)

The RICOCHET experiment aims to observe coherent elastic neutrino-nucleus scattering (CEvNS) with electron antineutrinos at the Institute Laue-Langevin (ILL) research nuclear reactor based in Grenoble, France. The setup is based on two arrays of cryogenic detectors operated at 10 mK: the CryoCube and the Q-Array. The CryoCube consists of 42-g germanium bolometers and achieves particle identification with ionization and phonon readout, and the Q-Array is based on phonon readout of superconducting zinc. The commissioning phase began with the installation of three CryoCube detectors in February 2024. This talk will present results from the first commissioning runs, focusing on detector resolution as well as background levels and rejection performance, and outline the progress expected for the science run that will start later this year.

Author: HAEGEL, Leila

Presenter: HAEGEL, Leila

Session Classification: Experiments 2

Contribution ID: **12** Type: **Poster**

Exploring New Physics Scenarios with Skipper-CCDs in CONNIE

Monday 9 June 2025 18:09 (3 minutes)

The COherent Neutrino-Nucleus Interaction Experiment (CONNIE) investigates coherent elastic neutrino-nucleus scattering (CEvNS) using high-resistivity silicon Skipper-CCDs at the Angra-2 nuclear reactor in Brazil. The introduction of Skipper-CCD technology has enabled an unprecedented low-energy threshold of 15 eV, significantly improving sensitivity to low-energy events and rare interactions. With an exposure of 18.4 g-days collected between 2021 and 2022, CONNIE has placed upper limits on CEvNS and provided valuable data for exploring physics beyond the Standard Model, including dark matter-electron scattering via diurnal modulation and the detection of relativistic millicharged particles from reactors. Additionally, Skipper-CCD data have been used to investigate non-standard neutrino interactions with new light mediators. This work presents CONNIE's latest results and examines how Skipper-CCD data can probe rare processes and explore new physics scenarios.

Author: ZILVES MAIO VENTURA, Pedro (São Paulo University)

Presenter: ZILVES MAIO VENTURA, Pedro (São Paulo University)

Session Classification: Poster session and reception

Contribution ID: **13** Type: **Talk**

Boron-8 solar neutrinos search with the LUX-ZEPLIN (LZ) experiment

Tuesday 10 June 2025 16:22 (18 minutes)

The detection of solar neutrinos via coherent elastic neutrino-nucleus scattering (CEvNS) in liquid xenon time projection chambers (TPCs) represents a major milestone in neutrino physics, offering a new lens into the cosmos. Over the past two decades, liquid xenon TPCs have driven dramatic progress in rare-event detection. In particular, the LUX-ZEPLIN (LZ) experiment, operating a two-phase xenon TPC with a 7-tonne liquid xenon target, currently leads the search for Weakly Interacting Massive Particles (WIMPs). In addition to its dark matter mission, LZ provides a powerful platform to probe beyond-WIMP signals, including those from neutrinos. In this talk, I will present the current status of LZ's search for Boron-8 solar neutrinos via CEvNS—a signal expected just above the threshold of detectability in current-generation detectors—and discuss novel analysis techniques developed to mitigate a key background: accidental coincidences between uncorrelated charge and light signals.

Author: OLCINA SAMBLAS, Ibles

Presenter: OLCINA SAMBLAS, Ibles

Session Classification: Experiments 5

Contribution ID: **14** Type: **Talk**

Muon-decay parameters from CEvNS measurements at Spallation Sources

Tuesday 10 June 2025 10:06 (18 minutes)

We demonstrate that CEvNS measurements at spallation sources are valuable probes of muon-decay physics. Using COHERENT data we derive the first constraint on the Michel parameters governing the $\bar{\nu}_\mu$ energy distribution. We also discuss future sensitivities and assess the implications for the Lorentz structure of the interactions mediating muon decay. Talk based on 2502.18175 and ongoing work.

Author: GONZALEZ-ALONSO, Martin (CERN)

Presenter: GONZALEZ-ALONSO, Martin (CERN)

Session Classification: Phenomenology 2

Contribution ID: **15** Type: **Talk**

Limits on Reactor Neutrino Nucleus Coherent Elastic Scattering with the TEXONO Program

Tuesday 10 June 2025 11:00 (18 minutes)

We will present a retrospective account of the TEXONO program on coherent neutrino nucleus scattering at the Kuo-Sheng Reactor Neutrino Laboratory in Taiwan with sub-keV germanium ionization detectors 1. The latest limits 2 and the various spinoff-impacts 3 will be discussed. We would provide updates on quantifying the quantum-mechanical coherency effects of the interactions 4. Efforts to continue and expand the program with reactor laboratories at the Sanmen Reactor in China will be summa-rized 5.

1. A.K. Soma et al., Nucl. Instrum. Meth. A 836, 67 (2016).
2. S. Karmakar et al., Phys. Rev. Lett. 134, 121802 (2025).
3. H.T. Wong, Int. J. Mod. Phys. A33, 1830014 (2018).
4. S. Kerman et al., Phys. Rev. D 93, 113006 (2016); V. Sharma et al., Phys .Rev. D 103, 092002 (2021).
5. L. Yang, Y. Liang and Q. Yue, PoS TAUP2023, 296 (2024).

Author: Prof. WONG, Henry (Institute of Physics, Academia Sinica)

Presenter: Prof. WONG, Henry (Institute of Physics, Academia Sinica)

Session Classification: Experiments 4

Contribution ID: **16** Type: **Poster**

Particle Tracking Classification in the CONNIE Experiment

Monday 9 June 2025 18:18 (3 minutes)

The Coherent Neutrino-Nucleus Interaction Experiment (CONNIE) operates at the Angra 2 Nuclear Reactor in Brazil. Using silicon Skipper-CCDs, CONNIE aims to identify and investigate coherent elastic neutrino-nucleus scattering (CEνNS). However, background particles from various sources, combined with the large volume of data, present significant challenges, making manual analysis of individual events impractical. To address these challenges, this work investigates and implements machine learning and image processing methodologies for classifying distinct CONNIE events.
A labeled dataset of real experimental events will also be created using the Annotation Redundancy with Targeted Quality Assurance (QA) method. This approach involves multiple annotators labeling the same data, enabling comparison to identify discrepancies, refine labeling accuracy, and enhance dataset reliability.

Author: DANTAS DOS SANTOS, Sara Mirthis (Universidade Estadual de Campinas - UNICAMP)

Co-authors: Dr NASTEVA, Irina (Universidade Federal do Rio de Janeiro - UFRJ); Dr DORNHOFER PARO COSTA, Paula (Universidade Estadual de Campinas - UNICAMP)

Presenter: DANTAS DOS SANTOS, Sara Mirthis (Universidade Estadual de Campinas - UNICAMP)

Session Classification: Poster session and reception

Contribution ID: **17** Type: **Talk**

Progress of CryoCsI detector R&D from COHERENT

Wednesday 11 June 2025 10:28 (18 minutes)

This presentation will detail the latest advancements in the development and characterization of a 6.6 kg proto-type CryoCsI detector, comprising two 3.3 kg cesium iodide (CsI) crystals operated at around 90K. Key performance metrics of the detector, including light yield optimization, spatial uniformity of signal response, and long-term stability under sustained cryogenic conditions, will be discussed to establish its viability for large-scale deployment. Additionally, results from a precision quenching factor measurement of pure CsI at low temperatures will be presented, providing critical insights into the scintillation efficiency of the material in recoil-based detection scenarios. Comprehensive steady-state background measurements, conducted to identify and mitigate noise sources, will be highlighted to demonstrate the detector's capability to operate in low-background environments. Finally, projections for the expected event rate of coherent elastic neutrino-nucleus scattering (CEvNS) interactions and the detector's resulting physical sensitivity to beyond-Standard-Model physics will be outlined, underscoring its potential to advance neutrino and dark matter research in upcoming phases of the experiment.

Author: SU, Chenguang (University of Chinese Academy of Sciences)

Presenter: SU, Chenguang (University of Chinese Academy of Sciences)

Session Classification: Experiments 6

Contribution ID: **18** Type: **Talk**

Calibrations and background simulations for the NEWS-G3 experiment

Monday 9 June 2025 17:28 (18 minutes)

The NEWS-G3 experiment aims at the detection of reactor neutrinos using a 60cm-diameter Spherical Proportional Counter (SPC) at high pressure. The low energy threshold down to single-electron detection and the electron-counting capabilities, allow for the detection of low energy nuclear recoils, with an estimated event rate of 5 events/bar/day/GW in argon at 20m from the reactor core. Flexibility in the choice of gas target allows for probing the CEvNS cross-section for different isotopes while the detector operates on site.

The G3 detector consists of a low-radioactivity copper sphere, enclosed in a cube compact shield made of layers of copper, polyethylene and lead. In addition, the shield is composed of a layer of twelve plastic scintillators acting as an active muon-veto. Calibrations up to 10 bar of pressure in Ar+2%CH4 have been conducted using a 30cm-diameter test detector. In order to limit voltage demands and prevent discharges, sensors with sub-mm anodes have been constructed down to 0.25mm in diameter. In addition, background simulations have been performed using GEANT4, expecting approximately 97% veto efficiency for the muon-induced background at sub-keV energies.

Author: SAVVIDIS, George (Queen's University)

Presenter: SAVVIDIS, George (Queen's University)

Session Classification: Experiments 3

Contribution ID: **19** Type: **Talk**

Status and prospects of the NUCLEUS experiment

Monday 9 June 2025 11:00 (18 minutes)

A precise characterization of CEνNS in the fully coherent regime will have important implications both in the search for new physics and in technological applications. To this aim, the NUCLEUS experiment will exploit the two reactor cores of the Chooz-B nuclear power plant in France as neutrino sources, and cryogenic calorimeters made of $CaWO_4$ and Al_2O_3 crystals read out by TES as neutrino detectors.
With a total target mass of 10g and a nuclear recoil energy threshold of O(10 eV), NUCLEUS aims to measure the CEvNS cross section with 10% statistical uncertainty in its first upcoming phase. Instrumented detector holders, a cryogenic active veto, layers of passive shielding and a muon veto constitute the system for background mitigation.
Recently, the experiment concluded its commissioning phase at the Technical University of Munich (TUM) with a measurement dedicated to the background model validation, successfully operating the different subsystems simultaneously. NUCLEUS is currently being relocated in its final experimental site, where an anti-neutrino flux of $1.7 \cdot 10^{12}$ ν/(cm2·s) is expected from the reactor.

Author: CAPPELLI, Matteo (Sapienza Universita e INFN, Roma I (IT))

Presenter: CAPPELLI, Matteo (Sapienza Universita e INFN, Roma I (IT))

Session Classification: Experiments 2

Contribution ID: **20** Type: **Talk**

The Standard Model tested with neutrinos

Monday 9 June 2025 14:22 (18 minutes)

The Standard Model (SM) has consistently provided a robust description of particle interactions, yet intriguing anomalies, particularly within the neutrino sector, suggest potential areas for further exploration. In this talk, we present a comprehensive global fit of coherent elastic neutrino-nucleus scattering (CEνNS) data from COHERENT (CsI, Ar), CONUS+, TEXONO, and neutrino-electron scattering (νES) data from TEXONO, LAMPF, LSND, BNL-E734, and CHARM-II experiments. Additionally, we incorporate complementary constraints derived from direct dark matter detection experiments such as LZ, XENONnT, and PandaX, exploiting their sensitivity to solar neutrinos.
Our analysis focuses on extracting precise measurements of the neutrino charge radius, a subtle yet critical electromagnetic property predicted by the SM. Results indicate good consistency with SM expectations, showing no significant evidence for flavor-dependent deviations beyond standard predictions. Notably, we provide stringent constraints on the tau neutrino charge radius from CEνNS and νES datasets, achieving unprecedented sensitivity.
The second part of our presentation addresses a global fit of the vector and axial-vector neutrino-electron neutral current couplings. By explicitly considering flavor dependencies and momentum-transfer corrections, we assess the electroweak theory's predictions and reveal two possible solutions: a scenario closely aligned with the SM and another degenerate solution presently favored by the data. We emphasize the importance of radiative corrections and momentum-dependence effects, highlighting their critical role in future precision measurements. Finally, we demonstrate that next-generation dark matter detectors have the potential to definitively resolve existing degeneracies, enabling an unprecedented test of the electroweak interaction in neutrino physics.

Author: CADEDDU, Matteo

Presenter: CADEDDU, Matteo

Session Classification: Phenomenology 1

Contribution ID: **21** Type: **Talk**

From observation to precision: the evolution of Coherent Elastic Neutrino-Nucleus Scattering

Tuesday 10 June 2025 09:00 (18 minutes)

Since its first observation in 2017, Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) has proven to be an effective method for testing the Standard Model of particle physics and searching for potential indications of new physics at low energies. In recent years, substantial progress has been made, including the first detection of CEvNS from reactor antineutrinos, as well as from solar neutrinos. In this talk, I will review the major results and key insights gained from the analysis of COHERENT data, highlighting the significant advancements achieved. These results mark the beginning of a new era in CEvNS research, with an emphasis on improving precision and deepening our understanding of neutrino interactions. I will also explore the exciting prospects for future COHERENT detectors, with a particular focus on the implications of a cryogenic cesium iodide detector and tonne-scale liquid argon one, which will play a pivotal role in advancing CEvNS measurements.

Author: CARGIOLI, Nicola

Presenter: CARGIOLI, Nicola

Session Classification: Phenomenology 2

Contribution ID: **22** Type: **Talk**

Detection of Elastic Coherent Neutrino Scattering, Qubit Decoherence, and Energy Accumulation-Release Processes in Materials

Wednesday 11 June 2025 12:21 (18 minutes)

The detection of nuclear recoils caused by elastic coherent scattering of solar and reactor neutrinos is of significant scientific and practical importance, representing a key milestone in the direct search for dark matter particles. While modern detectors are sensitive to registering these small energy depositions, a challenge lies in discriminating particle interactions from energy accumulation and delayed avalanche-like release processes present in detector materials. These processes are material-specific but occur universally across all detector types, with quantitative models lacking even for common materials.

In noble-liquid dual-phase detectors, like a B$- scale experiment planned by the XLZD collaboration, long-lived chemical radicals, metastable molecules, and clusters formed around impurities in the bulk liquid and at surfaces and interfaces can store energy for extended periods. However, investigations into these impurity-related backgrounds are complicated by the accumulation of electrons and ions at the liquid-gas interface. These issues can be addressed using ideas and techniques developed in studies of charged liquid surfaces and impurities and ions interactions with liquid and solid helium.

In solid-state low-temperature detectors, excess background noise is inherently tied to long and unsteady relaxation processes in disordered solids and glasses. Stored energy releases can mimic low-energy interactions with particles and cause quantum errors and decoherence in qubits but are much more frequent than particle incidence. These effects have been largely overlooked in extensive past and present studies of decorative materials in quantum materials.

Excess backgrounds in particle detectors are deeply connected to unresolved quantum materials challenges and longstanding condensed matter problems. With substantial investments in next-generation dark matter & neutrino detectors and in quantum information technologies, insufficient inter-disciplinary collaboration represents an organizational challenge that could prove costly when paradigm changes are needed.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-ABS-2004702

Author: PEREVERZEV, sergey (LLNL)

Presenter: PEREVERZEV, sergey (LLNL)

Session Classification: Phenomenology 4

Contribution ID: **23** Type: **Talk**

Status and prospects of RECODE program with PPC Germanium detector

Tuesday 10 June 2025 11:18 (7 minutes)

The RECODE (Reactor neutrino COherent scanning Detection Experiment) uses two sets of high-purity germanium arrays to accurately measure the CEvNS process of reactor neutrinos. The high-purity germanium technology used comes from the PPC germanium detector technology developed by CDEX in dark matter experiments. The currently confirmed experimental site is located at Sanmen Nuclear Power Plant (NPP) in Zhejiang Province, China. In the RECODE project, two experimental sites with different distances to the core will be set up to carry out joint measurements. The far site is approximately 22 m away from the 3.4 GWth reactor core, and the near site is about 10 m away. This will endow RECODE with advantages such as a high neutrino flux (˜5×10ˆ13 ν/cm2/s) and the reduction of errors through joint measurements. In this talk, the status and prospects of RECODE will be described and discussed.

Author: Dr YANG, Litao (Tsinghua University)

Presenter: Dr YANG, Litao (Tsinghua University)

Session Classification: Experiments 4

Contribution ID: **24** Type: **Talk**

Detecting Charged-Current Neutrino-Nucleus Interactions on Oxygen in a Heavy Water Cherenkov Detector

Wednesday 11 June 2025 14:00 (18 minutes)

At Oak Ridge National Laboratory (ORNL), the COHERENT collaboration has built a heavy water Cherenkov detector to measure the neutrino flux coming from the Spallation Neutron Source (SNS) via the scattering of neutrinos on deuterium nuclei, with the primary aim of improving the precision of past and future CEvNS measurements. Detector construction was completed and measurements began in the summer of 2023. Although this heavy water Cherenkov detector was built primarily to measure the SNS neutrino flux, it can also be used to measure the cross section of neutrino-nucleus charged-current interactions on ^{16}O nuclei. Charged-current $^{16}\mathrm{O}(\nu_e, e^-)\mathrm{X}$ reactions produce e^- that emit Cherenkov radiation within the detector. The SNS is the most powerful pulsed source of accelerator-based neutrinos in the world, which produces ν_e in a similar energy range to supernova neutrinos. Thus the measurement of this charged-current neutrino reaction in oxygen can improve supernova neutrino detection. This neutrino-oxygen interaction has also never been experimentally measured in this energy range, and thus its measurement can be a test of nuclear models. This presentation describes methodology for detecting and measuring the cross section and event rate of this charged-current interaction between ν_e and ^{16}O nuclei.

Author: WARD, Eli Mygatt

Presenter: WARD, Eli Mygatt

Session Classification: Experiments 7

Contribution ID: **25** Type: **Talk**

Unveiling Electroweak Physics in The Germanium CEvNS Era

Monday 9 June 2025 14:44 (18 minutes)

Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) is a powerful tool for probing both Standard Model (SM) and beyond-SM (BSM) physics. The remarkable CEvNS observations from the CONUS+ collaboration at nuclear reactors using a germanium target explore the fully coherent regime at unprecedentedly low energies, where nuclear structure uncertainties play a marginal role.

This talk presents the first comprehensive joint analysis of germanium-based CEvNS data at reactors, incorporating results from CONUS+, TEXONO, and νGeN alongside COHERENT CsI and Ar measurements, to gain new insights into the weak mixing angle, neutrino electromagnetic properties and new mediators. The role of elastic neutrino-electron scattering at reactors is also explored, providing the strongest direct limits to date on the millicharge of electron neutrinos.

Additionally, I will highlight the complementarity between reactor-based measurements and the COHERENT germanium observation, which exhibits a ~2σ deviation from SM expectation, motivating further studies to refine theoretical interpretations and to improve experimental precision.

Author: ATZORI CORONA, Mattia (Sapienza Universita e INFN, Roma I (IT))

Presenter: ATZORI CORONA, Mattia (Sapienza Universita e INFN, Roma I (IT))

Session Classification: Phenomenology 1

Contribution ID: **26** Type: **Talk**

On the uncertainty of CEvNS cross sections

Tuesday 10 June 2025 09:22 (18 minutes)

To consistently incorporate radiative corrections in coherent elastic neutrino-nucleus scattering (CEvNS), we develop and apply an effective field theory framework to provide precise predictions for CEvNS cross sections and neutrino flavor-dependent cross-section ratios for spin-0 nuclei. Additionally, I analyze (anti)neutrino energy spectra from radiative muon, pion, and kaon decays, which serve as key (anti)neutrino sources. I present the comprehensive error budget accounting for uncertainties at the nuclear, nucleon, hadron, and quark levels, with a perturbative error added in quadrature. In the 20-100 MeV energy range, the dominant uncertainty arises from the neutron distribution inside nuclei, while at lower energies, hadronic contributions become the primary limitation. In this update, I refine the treatment of hadronic uncertainties in CEvNS cross sections at very low energies, significantly reducing the current error estimate. These improvements have direct implications for all neutral-current processes in this energy regime, including parity-violating electron scattering, (anti)neutrino-electron scattering, and atomic parity violation.

Author: TOMALAK, Oleksandr

Presenter: TOMALAK, Oleksandr

Session Classification: Phenomenology 2

Contribution ID: **27** Type: **Talk**

Atucha II experiment: neutrino and BSM physics inside a nuclear power plant using Skipper-CCD

Wednesday 11 June 2025 09:22 (18 minutes)

Atucha-II is a short baseline neutrino experiment that employs 2.2 g of Skipper-CCD. The detector, installed inside the containment sphere of the 2 GWth Atucha II nuclear reactor at a distance of 12 m from the core, has been operating since December 2021. It currently achieves a readout noise of ˜ 0.20 e– by averaging 300 samples of the collected charge in each pixel, with a reactor-OFF background rate of ˜ 30 kdru. In addition to the search for the coherent elastic neutrino-nucleus scattering (CEνNS) of reactor antineutrinos with the silicon nucleiI, we recently reported, in collaboration with CONNIE, world leading limits on milli-charged particle charge across a mass range spanning six orders of magnitude, demonstrating the experiment's potential for rare-event searches. Here we discuss the analysis and experimental features that led to such results. Finally, we present upgrades of the experimental setup, including the addition of 1.4 tons of gamma shielding and assess their impact on the measured background.

Author: DEPAOLI, Eliana

Co-authors: Dr RODRIGUES FERREIRA MALTEZ, Dario Pablo (University of Buenos Aires); Dr SIDELNIK, Ivan (CONICET (Consejo Nacional de Investigaciones Cientifícas y Técnicas) - Centro Atómico Bariloche - Argentina); Mr BELLINO, Pablo (Comisión Nacional de Energía Atómica, Centro Atómico Constituyentes); Dr BOTTI, Ana Martina (Fermi National Accelerator Laboratory, PO Box 500, Batavia IL, 60510, USA); Dr CABABIE, Mariano (Institut für Hochenergiephysik der Österreichischen Akademie der Wissenschaften); Dr CHIERCHIE, Fernando (Instituto de Inv. en Ing. Eléctrica "Alfredo Desages" (IIIE), CONICET and Universidad Nacional del Sur (UNS), Bahía Blanca, Argentina.); Mr DELGADO, David (Central Nuclear ATUCHA I-II, Nucleoeléctrica Argentina Sociedad Anónima, Buenos Aires, Argentina.); Dr ESTRADA, Juan (Fermi National Accelerator Laboratory, PO Box 500, Batavia IL, 60510, USA); Dr FERNANDEZ MORONI, Guillermo (Fermi National Accelerator Laboratory, PO Box 500, Batavia IL, 60510, USA); Mr PEREZ GARCIA, Santiago Ezequiel (Fermi National Accelerator Lab. (US) and Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Física, Buenos Aires, Argentina and CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA), Buenos Aires, Argentina.); Dr TIFFENBERG, Javier (Fermi National Accelerator Laboratory, PO Box 500, Batavia IL, 60510, USA)

Presenter: DEPAOLI, Eliana

Session Classification: Experiments 6

Contribution ID: **28** Type: **Talk**

Neutrino magnetic dipole portal with low energy neutrino nucleus scattering data

Sterile neutrinos that couple to the Standard Model via the neutrino magnetic dipole portals have been extensively studied at various experiments. In this work, we scrutinize these interactions for sterile neutrinos in the mass range of 0.1–50 MeV through the nuclear and electron recoils at various neutrino scattering experiments. For the e-flavor specific dipole portal, we demonstrate that Dresden-II can provide leading constraints for m_N \lesssim 0.5 MeV, setting aside currently unresolved theoretical uncertainties. For the mu-flavor case, we show that the COHERENT experiment can probe a unique parameter region for in the mass range of 10–40 MeV with the full dataset collected by the CsI[Na] scintillation detector, including both the energy and timing structure of the neutrino beam. We also present limits on the parameter regions of the tau-flavor dipole portal using measurements of the solar neutrino flux from dark matter direct detection experiments.

Author: Prof. LI, Yufeng (Institute of High Energy Physics, Beijing)

Presenter: Prof. LI, Yufeng (Institute of High Energy Physics, Beijing)

Session Classification: Phenomenology 4

Contribution ID: **29** Type: **Poster**

Cosmogenic muons in the CCM experiment at LANL

Monday 9 June 2025 18:00 (3 minutes)

Coherent CAPTAIN-Mills (CCM) is a 10 ton liquid argon scintillation detector at Los Alamos National Laboratory for the study of neutrino and beyond Standard Model physics. It is located 23 m from the stopped pion source of the Lujan Facility, and will receive 1.5×10^{22} POT in its ongoing 3-year run cycle. CCM is instrumented with 200 8-inch PMTs, of which 80% are coated with wavelength shifting tetraphenyl-butadiene, and 40 1-inch veto PMTs in an optically isolated veto. Cosmogenic muons provide a means of calibrating the detector in the energy range from 100 to 600 MeV of deposited energy. Simulations of the cosmogenic flux can provide important insights as to the overall detector response. In this poster, we present progress towards the development of a calibration based on the predicted shape and rate of the muon spectrum at CCM. We also address the role of Michels electrons, which produce signals in the 10 to 60 MeV energy range. Using a similar strategy as for muons, we aim to model the detector response in this lower energy regime. Finally, some prospects of the experiment's physics reach are also presented.

Author: MACIAS ACEVEDO , Cristian Fabian (Universidad Nacional Autónoma de México)

Presenter: MACIAS ACEVEDO , Cristian Fabian (Universidad Nacional Autónoma de México)

Session Classification: Poster session and reception

Contribution ID: **30** Type: **Poster**

Isotopically enriched detectors as a tool for low-threshold CEvNS detection

Monday 9 June 2025 18:12 (3 minutes)

In this work we present a study of Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) with a proposed array of isotopic enriched detectors. These detectors could improve the precision of CEvNS measurements, allowing to test predictions of the Standard Model, nuclear physics and new physics scenarios, due to the correlation of the systematic uncertainties. Based on these results, we explore how such detectors would behave if the nuclear recoil energy is transferred to lattices excitations, in particular phonons. We will review the dark matter-phonon effective field theory aiming to model the phonon response of isotopically enriched materials to CEvNS- induced recoil in order to evaluate the potential for single- and multi-phonon excitations in different isotopic configurations. Lower threshold detectors have been proposed for CEvNS studies using a variety of technologies, many of which may have additional isotopic effects that need to be studied carefully.

Author: DUQUE HERRERA, Laura

Co-authors: Dr GALINDO-URIBARRI, Alfredo; SANCHEZ GARCIA, Gonzalo (Instituto de Física Corpuscular CSIC/UV (Valencia, Spain)); HERNANDEZ, Israel (Illinois Institute of Technology); MIRANDA, Omar (Cinvestav Centro de Investigacion y de Estudios Avanzados del IPN)

Presenter: DUQUE HERRERA, Laura

Session Classification: Poster session and reception

Contribution ID: **31** Type: **Poster**

Development and Characterization of a Cryogenic CsI Detector for Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) Measurements

Monday 9 June 2025 18:06 (3 minutes)

Our research group has developed a novel approach to detect Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) signals using cesium iodide (CsI) crystals operated at liquid nitrogen temperatures. This poster presents the results of comprehensive tests conducted on the CsI crystals, including low-temperature light yield, spatial uniformity of light emission, and background measurements post-shielding.

Methods:

Low-Temperature Light Yield: The light yield of the CsI crystals was measured at cryogenic temperatures, demonstrating an exceptional value of approximately 28 photoelectrons per keV electron-equivalent (PE/keVee), which meets the stringent requirements for CEvNS detection.
Spatial Uniformity: The uniformity of light emission across the crystal was evaluated by placing a calibrated Am-241 source at various positions on the crystal and recording the corresponding light yield. The results indicate excellent spatial uniformity across the crystal.
Background Measurements: Post-shielding measurements were conducted to assess the residual intrinsic radioactivity of the crystal and the remaining environmental background. Both were found to be within expected levels, ensuring a low background environment for CEvNS detection.
Conclusion:
The CsI crystals exhibit outstanding performance in terms of light yield, spatial uniformity, and low background levels, making them highly suitable for CEvNS experiments. These results validate the feasibility of using cryogenic CsI crystals as a robust and sensitive detector for CEvNS studies.

Authors: Mr SU, Chenguang (UCAS); Mr KONG, Lingquan

Presenter: Mr KONG, Lingquan

Session Classification: Poster session and reception

Contribution ID: **32** Type: **Talk**

New results from the CRAB Experiment

Monday 9 June 2025 11:22 (18 minutes)

The CRAB (Calibrated nuclear Recoils for Accurate Bolometry) project is aimed at precise calibration of cryogenic detectors at sub-keV nuclear recoil energies, addressing key challenges in coherent neutrino scattering and low-mass dark matter detection.
After the successful validation of the method, demonstrated by the detection of recoil peaks in cryogenic detectors exposed to a commercial neutron source, an innovative experimental setup has been installed at the Atominstitut TRIGA Mark-II reactor in Vienna. A cryostat is combined with a low-intensity thermal neutron beam and gamma detectors to achieve high precision measurements. In this talk, we present the first commissioning results, including stable cryogenic detector operation, validation of our understanding of the external backgrounds and world's first observation of neutron capture induced coincidences between gamma detectors and cryogenic targets. These results pave the way for a broad physics program with various target materials, including CaWO4, Al2O3, Ge, Si.

Author: STRAUSS, Raimund Johann (Technische Universitaet Muenchen (DE))

Presenter: STRAUSS, Raimund Johann (Technische Universitaet Muenchen (DE))

Session Classification: Experiments 2

Contribution ID: **33** Type: **Talk**

Testing the Gallium neutrino anomaly⋯with CEνNS?

Monday 9 June 2025 16:22 (18 minutes)

The capability to perform precision measurements of nuclear form factors or coupling constants with CEνNS relies on a precise knowledge of the incoming neutrino flux and spectrum. Isotopes decaying via electron capture (EC) represent a close-to-ideal neutrino source, thanks to the monoenergetic spectrum and the possibility of precisely measuring the source activity. However, the low energy of emitted neutrinos would require detectors with a trigger threshold at the eV level.

Lithium is the only target material that could practically be used to detect EC neutrinos, at the cost of a poor event rate due to the low neutron content. First, lithium's low nuclear mass would relax the threshold requirement up to 50 eV. Second, several lithium-containing crystals are commercially available and could be used as bolometers. Third, lithium can easily be enriched to 99% in 6Li or 7Li, allowing to perform a differential measurement of the neutrino flux and to disentangle the vector and axial-vector components of CEνNS.

In this contribution, we will present the requirements for a hypothetical lithium-based bolometric experiment and its sensitivity to CEνNS. In addition, we will discuss the possibility to exploit such an experiment for a truly independent cross-check of the Gallium neutrino anomaly.

Author: PUIU, Andrei

Presenter: PUIU, Andrei

Session Classification: Experiments 3

Contribution ID: **34** Type: **Talk**

The MIGDAL Experiment: Current Status and Future Plans

Monday 9 June 2025 16:44 (18 minutes)

The Migdal In Galactic Dark mAtter expLoration (MIGDAL) detector is a state-of-the-art low energy optical time projection chamber capable of resolving low dE/dx electrons alongside very high dE/dx nuclear recoils. The goal of this experiment is to make the first observation of the Migdal effect, a rare nuclear scattering process invoked to extend the sensitivity of dark matter experiments to light WIMPs. To date, the MIGDAL experiment has completed two science runs and is expected to begin the third in the coming months. I will give a preview of results from the ongoing analysis and show results demonstrating the performance of the detector. I will also discuss R&D with negative ion drift gas mixtures that include a high fraction of noble gases. The goals of this work is to enhance spatial resolution needed for low energy track reconstruction for Migdal and other rare searches.

Author: TILLY, Elizabeth

Presenter: TILLY, Elizabeth

Session Classification: Experiments 3

Contribution ID: **35** Type: **Talk**

Phenomenology of CEvNS from reactor antineutrinos

Wednesday 11 June 2025 11:15 (18 minutes)

The detection of CEvNS from reactor sources represents a unique opportunity to test beyond the Standard Model physics in the neutrino sector. In this talk, we present the phenomenological implications of the first CONUS+ observation of CEvNS for different new physics scenarios, including non-standard interactions, electromagnetic properties of neutrinos and light mediators. The results obtained from our analysis are competitive when compared to CEvNS bounds from spallation source experiments and, in some cases, to other neutrino detection mechanisms, showing the complementarity between different neutrino experiments at low energies.

Author: SANCHEZ GARCIA, Gonzalo (Instituto de Física Corpuscular CSIC/UV (Valencia, Spain))

Presenter: SANCHEZ GARCIA, Gonzalo (Instituto de Física Corpuscular CSIC/UV (Valencia, Spain))

Session Classification: Phenomenology 4

Contribution ID: **36** Type: **Talk**

CEνNS phenomenology with first data at direct detection experiments

Monday 9 June 2025 14:00 (18 minutes)

In this talk I will discuss some implications of the first indication of nuclear recoils from solar neutrinos on a xenon target at direct detection experiments. By analyzing data from the XENONnT and PandaX-4T experiments, I will present the first constraints on new interactions and neutrino electromagnetic properties from the first CEνNS data using solar 8B neutrinos.

Author: DE ROMERI, Valentina (IFIC CSIC/UV (Valencia, Spain))

Presenter: DE ROMERI, Valentina (IFIC CSIC/UV (Valencia, Spain))

Session Classification: Phenomenology 1

Contribution ID: **37** Type: **Talk**

Status of RED-100

Wednesday 11 June 2025 09:44 (18 minutes)

The RED-100 is a two-phase noble gas emission detector build for observation of a coherent elastic neutrino-nucleus scattering (CEvNS) in reactor antineutrino interactions with matter. The fist data taking run with LXe target was carried out at the Kalinin nuclear power plant in 2022, and the final results are given. The RED-100 experiment is currently in preparation to the Phase II, with LAr. The laboratory tests have shown that the LAr is a much better working medium from the point of view of the background caused by the delayed electrons. Challenges and technical solutions of detection low-energy signals with the RED-100 detector are discussed.

Author: AKIMOV, Dmitry

Presenter: AKIMOV, Dmitry

Session Classification: Experiments 6

Contribution ID: **38** Type: **Poster**

Deep Learning for Background Rejection in the CONNIE Experiment

Monday 9 June 2025 18:03 (3 minutes)

The Coherent Neutrino Nucleus Interaction Experiment (CONNIE) aims to detect, for the first time, coherent elastic antineutrino-nucleus scattering (CEvNS) in silicon and probe physics beyond the Standard Model. To that end, the experiment has been taking data next to the Angra 2 nuclear power plant since mid-2021 with high-sensitivity detectors known as Skipper-CCDs. These pixelated sensors consist of an array of coupled capacitors and operate through a sequential readout process. Their nondestructive readout capability, which enables multiple measurements of the same charge, has been demonstrated to significantly reduce readout noise to sub-electron levels, making them well suited for detecting low-energy interactions. To improve the background event rejection, we are assessing the use of a convolutional neural network to estimate the depth in the Silicon of single hit events. The training and validation of this network are based on simulated images. This work presents the algorithm used to simulate the signal of such single-hit events in the detector, as well as the current development status of the neural network. This tool is expected to help further reduce background levels in the experiment and support the search for coherent antineutrino-nucleus scattering.

Authors: OLIVEIRA, Ana Carolina (Centro Brasileiro de Pesquisas Físicas); Prof. BONIFAZI, Carla (Centro Brasileiro de Pesquisas Físicas); Prof. MAKLER, Martin (Centro Brasileiro de Pesquisas Físicas)

Presenter: OLIVEIRA, Ana Carolina (Centro Brasileiro de Pesquisas Físicas)

Session Classification: Poster session and reception

Contribution ID: **39** Type: **Poster**

Status and Prospect of the COHERENT D2O Detector for the Neutrino Flux Normalization

Monday 9 June 2025 18:30 (3 minutes)

After the detection of CEνNS, the COHERENT collaboration is exploring new physics by precisely measuring the process. However, the uncertainty of the neutrino flux normalization is limiting the precision. To reduce the uncertainty, a heavy water (D_2O) detector has taken data at the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory (ORNL) since 2023. By utilizing the well-understood charged-current interaction of deuterium, this D_2O detector is anticipated to reduce the flux uncertainty from 10% to less than 3% within a few years. In addition, the second module, made of water (H_2O), was recently installed to further understand the neutrino interaction with oxygen. This poster will present the status of the detectors, especially focusing on the second H_2O module installation. Their anticipated impact on the precision measurement of CEνNS will also be covered.

Author: LEE, Seung Mok (Carnegie Mellon University)

Presenter: LEE, Seung Mok (Carnegie Mellon University)

Session Classification: Poster session and reception

Contribution ID: **40** Type: **Talk**

Towards the first measurement of low-energy electron neutrino charged-current scattering on argon with the CCM experiment

Wednesday 11 June 2025 14:44 (18 minutes)

The Coherent CAPTAIN-Mills (CCM) experiment, located at Los Alamos National Laboratory, employs a 10-ton liquid argon detector to study neutrino interactions, search for dark matter candidates, and explore physics beyond the Standard Model.
In this work, we present ongoing efforts towards enabling the first measurement of low-energy charged-current (CC) scattering of electron neutrinos on argon nuclei. In particular, this interaction has yet to be measured at low energies, and the absence of experimental data represents a challenge for future efforts to detect supernova neutrinos via this channel, such as in the DUNE experiment.
We describe the development and integration of a complete simulation framework, where electron neutrino interactions are modeled using the MARLEY event generator and injected into the detector geometry via the SIREN software package, followed by detailed detector simulation with Geant4 and event reconstruction with the CCMAnalysis framework. We present preliminary results of the expected signal characteristics, including energy deposition, photon production, and reconstruction observables, demonstrating the capabilities of CCM to detect and analyze low-energy CC events.

Author: CHÁVEZ ESTRADA, Marisol (Instituto de Ciencias Nucleares UNAM)

Presenter: CHÁVEZ ESTRADA, Marisol (Instituto de Ciencias Nucleares UNAM)

Session Classification: Experiments 7

Contribution ID: **41** Type: **Talk**

Complementarity between CEνNS and dark matter direct searches experiments for light gauge mediators

Tuesday 10 June 2025 14:22 (18 minutes)

Searching for dark matter and new light mediators enters a precision era driven by rapid advances in coherent elastic neutrino-nucleus scattering (CEνNS) experiments and direct detection of dark matter. This talk will focus on U(1)′ extensions of the Standard Model. We will explore how CEνNS experiments constrain this sector and how this complements the direct detection results when the light gauge boson is the portal between the dark sector and the Standard Model. We will examine how complementary constraints from beam dump experiments, LHCb, and BABAR further shape the viable parameter space.

Author: PEINADO, Eduardo

Presenter: PEINADO, Eduardo

Session Classification: Phenomenology 3

Contribution ID: **42** Type: **Talk**

Neutrino fog and Dark Matter Direct Detection Experiments: A BSM point of view

Wednesday 11 June 2025 11:37 (18 minutes)

As direct detection experiments approach sensitivities where neutrinos become an irreducible background due to their interactions via coherent elastic neutrino-nucleus scattering (CEvNS), they pose a fundamental limitation in the search for Dark Matter. Given that CEvNS has only recently been observed, there remains significant room for new physics beyond the Standard Model (BSM) to alter the expected neutrino-induced recoil spectrum. In this talk, we examine how various BSM scenarios can modify the characteristics of the "neutrino fog", and assess their implications for the interpretation of future Dark Matter signals.

Author: PEREZ-GONZALEZ, Yuber F

Presenter: PEREZ-GONZALEZ, Yuber F

Session Classification: Phenomenology 4

Contribution ID: **43** Type: **Talk**

Status of the GanESS project

Monday 9 June 2025 09:45 (18 minutes)

I will present the current status of the experiment GanESS and the GaP proptotype, an effort to detect Coherent Elastic Neutrino-Nucleus Scattering (CEνNS) at the European Spallation Source (ESS), utilizing high-pressure Time Projection Chambers (TPCs) as the detection technology. The use of high-pressure noble gas TPCs allows for very good energy resolution and sub-keV thresholds, essential for observing the tiny nuclear recoils expected from CEνNS events. We discuss the detector design, expected performance, and initial commissioning results.

Author: MONRABAL-CAPILLA, Francesc (Donostia International Physics Center (DIPC) (ES))

Presenter: MONRABAL-CAPILLA, Francesc (Donostia International Physics Center (DIPC) (ES))

Session Classification: Experiments 1

Contribution ID: **44** Type: **Talk**

Neutron scatter camera for characterizing the background at CEvNS experimental sites

Wednesday 11 June 2025 15:06 (18 minutes)

For the CEνNS experiments that we are developing at the Donostia International Physics Center (DIPC), it is essential to characterize the neutrons produced at the facility. The European Spallation Source (ESS) being one of the promising experimental facilities for the observation of CEνNS, detailed simulations of the neutron background at the ESS have been performed. However, as in every experiment these will have to be corroborated with in situ measurements. A simple and useful technology to locate possible neutron hot spots or leaks, is the neutron scatter camera. This camera will be used to characterize the neutron background at the possible experimental sites in order to evaluate their feasibility and perform a careful shielding strategy. This talk aims show the operation of the 4π coverage compact and mobile neutron camera we developed and demonstrate its capability to stop a ^{252}Cf source located at several positions in a room.

Author: LARIZGOITIA, Leire (DIPC)

Co-authors: MONRABAL, Francesc (DIPC, Ikerbasque); COLLAR, Juan (University of Chicago, KICP, DIPC); LEWIS, Mark (DIPC); YOON, Seok-Gyeong (University of Chicago); SIMÓN, Ander (DIPC, IFIC); RENNER, Josh (IFIC)

Presenter: LARIZGOITIA, Leire (DIPC)

Session Classification: Experiments 7

Contribution ID: **45** Type: **Talk**

Inelastic neutrino-nucleus scattering: a hybrid nuclear model approach

Tuesday 10 June 2025 09:44 (18 minutes)

We present nuclear structure calculations adopting a novel hybrid nuclear model, combining the nuclear shell model and the microscopic quasiparticle-phonon model 1. The predictivity of the hybrid model is tested by computing inelastic neutral-current neutrino-nucleus scattering cross sections off the stable thallium isotopes, taking also into account the effect of nuclear recoil energy. The model is applied assuming neutrinos emerging from: i) the sun, ii) pion-decay at rest and iii) the diffuse supernova neutrino background. Regarding solar neutrino rates, the new results are compared with previously reported results based solely on nuclear shell model calculations 2, demonstrating the improved accuracy of the adopted hybrid model at higher neutrino energies.

References

1 H. Matti, D. Papoulias, J. Suhonen, accepted in Phys. Lett. B.

2 D. Papoulias, H. Matti, J. Suhonen, Phys. Rev. C 110 (2024), 3, 034309.

Author: Dr PAPOULIAS, Dimitrios (IFIC (CSIC/Valencia U.))

Presenter: Dr PAPOULIAS, Dimitrios (IFIC (CSIC/Valencia U.))

Session Classification: Phenomenology 2

Contribution ID: **46** Type: **Poster**

Probing light vector mediators with coherent scattering at future facilities

Monday 9 June 2025 18:24 (3 minutes)

Future experiments dedicated to the detection of Coherent Elastic Neutrino-Nucleus Scattering may be powerful tools in probing light new physics. In this paper we study the sensitivity on light Z′ mediators of two proposed experiments: a directional low pressure Time Projection Chamber detector, νBDX-DRIFT, that will utilize neutrinos produced at the Long Baseline Neutrino Facility, and several possible experiments to be installed at the European Spallation Source. We compare the results obtained with existing limits from fixed-target, accelerator, solar neutrino and reactor experiments.

Authors: BERTUZZO, ENRICO; Dr GRILLI DI CORTONA, Giovanni (INFN Laboratori Nazionali di Frascati); DANTAS RAMOS, Lucas Magno

Presenter: DANTAS RAMOS, Lucas Magno

Session Classification: Poster session and reception

Contribution ID: **47** Type: **Talk**

LMA-Dark: Large New Physics Effects in Neutrino Oscillations

Tuesday 10 June 2025 14:00 (18 minutes)

In neutrino oscillation physics numerous exact degeneracies exist under the name LMA-Dark. These degeneracies make it impossible to determine the sign of Δm^2_{31} known as the atmospheric mass ordering with oscillation experiments alone in the presence of new neutrino interactions. The combination of different measurements including multiple oscillation channels and neutrino scattering experiments lifts some aspects of these degeneracies. In fact, previous measurements of coherent elastic neutrino nucleus scattering (CEvNS) by COHERENT already ruled out the LMA-Dark solution for new physics with mediators heavier than $M_{Z'} \sim 50$ MeV while cosmological considerations disfavor these scenarios for mediators lighter than $M_{Z'} \sim 3$ MeV. Here we leverage new reactor data which provides the strongest bounds on CEvNS with light mediators to date. We show that this data completely removes the degeneracies in the ν_e sector for mediators down to the MeV scale at which point constraints from the early universe take over. While the LMA-Dark degeneracy is lifted in the ν_e sector, it can still be restored in the ν_μ and ν_τ sector or with very specific couplings to up and down quarks, and we speculate on a path forward.

Author: Dr DENTON, Peter (Brookhaven National Laboratory)

Presenter: Dr DENTON, Peter (Brookhaven National Laboratory)

Session Classification: Phenomenology 3

Contribution ID: **48** Type: **Talk**

Testing lepton non-unitarity with the next generation of CEvNS reactor experiments

Tuesday 10 June 2025 15:05 (18 minutes)

In the last years, the long predicted Standard Model reaction channel of coherent elastic neutrino-nucleus scattering (CEvNS) has been confirmed by measurements of (anti-)neutrinos emitted from pion decay at rest sources and nuclear reactors, also with multiple target materials. As we slowly transition with the next generation of experiments from first observations to precision measurements, CEvNS opens up a plethora of possibilities for investigations within the Standard Model and beyond. This talk will focus on testing lepton non-unitarity with the next generation of reactor experiments. Depending on the new physics origin of non-unitarity, the associated phenomenology can vary significantly. By examining both high scale (seesaw limit) and low scale (light sterile limit) scenarios, we show how coherent elastic neutrino-nucleus and elastic electron-neutrino scattering are altered by new physics. We present sensitivities to corresponding parameters by exploiting the potential of future germanium-based reactor experiments. In doing so, we underline the importance of CEvNS experiments for new physics searches, highlighting their role in advancing our understanding of fundamental interactions.

Authors: Prof. LINDNER, Manfred (Max-Planck-Institut fuer Kernphysik, Heidelberg, Germany); CENTELLES CHULIA, Salvador (Max-Planck-Institut für Kernphysik); RINK, Thomas (Karlsruhe Institute of Technology (KIT))

Presenter: RINK, Thomas (Karlsruhe Institute of Technology (KIT))

Session Classification: Phenomenology 3

Contribution ID: **49** Type: **Poster**

Muon track reconstruction for the spatial calibration of sensors in the search for dark matter

Monday 9 June 2025 18:15 (3 minutes)

The search for dark matter requires extremely sensitive detection techniques. In this context, atmospheric muons, though typically considered background, can be used as a tool for detector spatial calibration. This work is based on data from the CONNIE experiment, which employs a vertical array of CCD sensors to detect ionizing particles at a distance of 30 meters from the core of the Angra 2 nuclear reactor in Rio de Janeiro, Brazil. A high purity sample of muons was extracted, their trajectories were reconstructed, and their spatial distribution was characterized. A calibration method based on identifying muon coincidences across sensors was developed, allowing the determination of relative misalignments between detectors with a precision better than 45 micrometers. This technique constitutes a valuable tool for low energy particle physics experiments.

Authors: MARTÍNEZ, Camila; BONIFAZI, Carla (Centro Brasileiro de Pesquisas Físicas); Dr RODRIGUES FERREIRA MALTEZ, Dario Pablo (University of Buenos Aires)

Co-author: PEREZ GARCIA, Santiago Ezequiel (Fermi National Accelerator Lab. (US) and Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Física, Buenos Aires, Argentina and CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA), Buenos Aires, Argentina.)

Presenter: MARTÍNEZ, Camila

Session Classification: Poster session and reception

Contribution ID: **50** Type: **Poster**

Quenching Factor Determination with Skipper-CCD Technology

Monday 9 June 2025 18:27 (3 minutes)

The quenching factor in silicon is a fundamental parameter for particle physics experiments that detect nuclear recoils. This is particularly critical for experiments employing CCD sensors as target materials—such as CONNIE and Atucha—which rely on it to convert ionization signals into nuclear recoil energies. Its importance extends beyond neutrino detection, playing a central role in dark matter searches as well. In this work, we introduce a novel technique for determining the quenching factor using Skipper-CCD technology in combination with an unfolding method. We also explore a machine learning approach for distinguishing between neutron and gamma-induced tracks. The proposed data processing strategy is described, along with an analysis of its limitations and a discussion of the benefits and challenges associated with the two experimental sites.

Author: Ms HARTZSTEIN, Sol Dominique (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales)

Co-authors: Mr BELLINO, Pablo (Comisión Nacional de Energía Atómica, Centro Atómico Ezeiza); Ms BENAS, Sabrina (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales); Ms DEAPAOLI, Eliana (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, y Comisión Nacional de Energía Atómica, Centro Atómico Constituyentes); Dr GOMEZ GUZMAN, Jose Manuel (Forschungs-Neutronenquelle Heinz Maier-Leibnitz (FRM II) Technische Universität München, Germany); Prof. RODRIGUES, Dario (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales y CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA). Buenos Aires, Argentina)

Presenter: Ms HARTZSTEIN, Sol Dominique (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales)

Session Classification: Poster session and reception

Contribution ID: **51** Type: **Talk**

Oscillation portals to new physics with CEvNS and nu-e scattering

Monday 9 June 2025 15:06 (18 minutes)

In this talk I will present some novel ideas to constrain new forces coupled to a secluded sector of particles. To access these sectors, neutrinos must first oscillate via (ultra-)long-baseline oscillations to the dark fermions. Then, via a dark photon or similar mediators, these dark fermions induce CEvNS or nu-e scattering events in underground detectors. These scenarios also typically induce CEvNS events from dark fermions produced in π^0 decays at SNS, for example. To constrain the longest oscillations to dark fermions, CEvNS measurements with solar neutrinos are the most advantageous.

Authors: THOMPSON, Adrian; Dr BIGARAN, Innes (Fermilab and Northwestern University); HOSTERT, Matheus; MISHRA, Nityasa

Presenter: HOSTERT, Matheus

Session Classification: Phenomenology 1

Contribution ID: **52** Type: **Talk**

Status of CICENNS Experiment

Monday 9 June 2025 10:07 (18 minutes)

The CICENNS (CsI detector for Coherent Elastic Neutrino Nucleus Scattering) experiment aims to construct a CsI(Na) detector array with total mass of 300 kg, located at the China Spallation Neutron Source (CSNS), for the precise measurement of CEvNS signals. I will present the plan, status, and physics goals of CICENNS in this talk.

Author: Prof. XIAO, Xiang (Sun Yat-sen University (China))

Presenter: Prof. XIAO, Xiang (Sun Yat-sen University (China))

Session Classification: Experiments 1

Contribution ID: **53** Type: **Talk**

HPGe for CEvNS

Tuesday 10 June 2025 12:17 (18 minutes)

For a successful CEvNS detection, a detector with a low enough noise threshold is required. HPGe spectrometers are highly suitable for this task due to the large number of charge carriers created in particle interactions, the high level of radiopurity that can be achieved and the possibility to have kg-sized detector masses. The developments in the last decades on noise levels make it feasible to achieve thresholds in the few hundreds eV range.
In my talk, I will give a review on setups, new developments and challenges. I will sketch out ideas for future large-sized experiments.

Author: HAKENMUELLER, Janina Dorin (Duke University)

Presenter: HAKENMUELLER, Janina Dorin (Duke University)

Session Classification: Experiments 4

Contribution ID: **54** Type: **Poster**

Preliminary measurement of the ionisation yield for nuclear recoils with Ricochet commissioning data

Monday 9 June 2025 18:21 (3 minutes)

The Ricochet experiment is an international collaboration that aims at detecting the CEvNS process using germanium crystal calorimeters at cryogenic temperatures. The detectors can simultaneously readout the ionization and heat energies following particle interactions occurring in the crystal. This dual measurement allows to both perform particle identification, i.e. to discriminate between electronic and nuclear recoils, and to determine the recoil energy of the interactions. This poster presents a preliminary study dedicated to measuring the ionisation yield of nuclear recoils at the keV energy scale based on the first Ricochet commissioning data.

Author: LE BELLEC, Tatiana (IP2I)

Presenter: LE BELLEC, Tatiana (IP2I)

Session Classification: Poster session and reception

Contribution ID: **55** Type: **Talk**

Precision probes of electroweak and BSM physics with coherent elastic neutrino-nucleus scattering: Insights from CONUS+ and prospects at the upcoming European spallation source

Tuesday 10 June 2025 14:44 (18 minutes)

With the rapid advancement of low-energy neutrino experiments, coherent elastic neutrino-nucleus scattering (CEνNS) has become a powerful tool for precision studies in both Standard Model (SM) and beyond-the-Standard-Model physics. I will present our recent works based on recent and projected phenomenological studies of CEνNS at two key facilities: the CONUS+ reactor experiment |1| and the upcoming European Spallation Source (ESS) |2|. From the latest CONUS+ data, which have recently detected reactor-based CEνNS signal at 3.7σ significance |3|, we have derived the constraints on the weak mixing angle and bounds on neutrino electromagnetic properties, including magnetic moment, charge radius, and electric millicharge. We also have investigated light mediators within the neutrino generalized interactions (NGIs) framework. For the ESS, we have performed a detailed sensitivity projection using its anticipated high-intensity neutrino flux and diverse proposed detector technologies. We have obtained precision estimates for SM parameters such as the weak mixing angle and neutron nuclear rms radii, as well as projected limits on NGI couplings across a wide range of mediator masses. Additionally, we have explored electromagnetic upscattering production of sterile neutral leptons via dipole portal scenarios. These results underscore the growing role of CEνNS as a precision frontier in neutrino physics, with current measurements already yielding impactful constraints and future experiments poised to significantly expand the reach of both electroweak and new physics searches.

References:

|1| A. Chattaraj, *Anirban Majumdar*, and R. Srivastava, **"Probing Standard Model and Beyond with Reactor CEνNS Data of CONUS+ Experiment,"** Physics Letters B, Vol. 864 (2025), 139438, arXiv:2501.12441 \[hep-ph\].

|2| A. Chattaraj, *Anirban Majumdar*, D. K. Papoulias, and R. Srivastava, **"Probing conventional and new physics at the ESS with coherent elastic neutrino-nucleus scattering,"** Journal of High Energy Physics, Vol. 05 (2025), 064, arXiv:2501.12443 \[hep-ph\].

|3| *[CONUS+ Collaboration]*, N. Ackermann et al., **"First observation of reactor antineutrinos by coherent scattering,"** arXiv:2501.05206 \[hep-ex\].

Authors: Mr CHATTARAJ, Ayan (Indian Institute of Science, Education & Research - Bhopal); Mr MAJUMDAR, Anirban (Indian Institute of Science, Education & Research - Bhopal); Dr PAPOULIAS, Dimitrios (Institut de Física Corpuscular (CSIC/Universitat de València)); Dr SRIVASTAVA, Rahul (Indian Institute of Science, Education & Research - Bhopal)

Presenter: Mr MAJUMDAR, Anirban (Indian Institute of Science, Education & Research - Bhopal)

Session Classification: Phenomenology 3

Contribution ID: **56** Type: **Talk**

COHERENT in 2025

Monday 9 June 2025 09:20 (20 minutes)

The COHERENT Collaboration is continuing its efforts to measure CEvNS and inelastic neutrino interactions at Oak Ridge National Laboratory's Spallation Neutron Source. This presentation will include an overall summary of COHERENT's efforts as the Collaboration transitions from first-light CEvNS observations to precision measurements with larger-mass detector systems and a power-upgraded SNS. An update on the status of operating detector systems as well as plans for in-progress and future deployments will be presented.

Author: GREEN, Matthew (NC State University)

Presenter: GREEN, Matthew (NC State University)

Session Classification: Experiments 1

Contribution ID: **57** Type: **Talk**

Status and latest results from CONNIE

Wednesday 11 June 2025 09:00 (18 minutes)

The CONNIE experiment began operating with Skipper-CCDs in 2021, marking the first use of Skipper technology in a reactor neutrino experiment. This technology enables charge measurements with sub-electron resolution, enhancing the ability to detect and characterize low-energy signals. As a result, the experiment achieved a detection threshold as low as 15 eV. Data collected with exposures of 14.9 g-days (reactor-on) and 3.5 g-days (reactor-off) were used to set upper limits on the CEvNS interaction rate comparable to those obtained in earlier runs with standard CCDs and significantly larger exposures. Beyond the CEvNS search, we explored the broader physics potential of Skipper-CCDs through three dedicated analyses: constraints on neutrino interactions via light vector mediators, limits on dark matter-electron scattering from diurnal modulation, and a search for relativistic millicharged particles. In the latter, we set world-leading bounds on the charge of particles with masses between 1 eV and 10 MeV, combining data from CONNIE with results from a complementary Skipper-CCD experiment at the Atucha II reactor. In 2024, a new Multi-Chip Module (MCM) with 16 Skipper-CCDs, based on the Oscura experiment design, was installed at CONNIE, increasing the active silicon mass to 8 grams. In this talk, We will present the latest results, share progress on the MCM commissioning, and discuss future prospects for CEvNS detection with Skipper-CCDs.

Authors: BONIFAZI, Carla (ICAS-ICIFI-UNSAM/CONICET); FOR THE CONNIE COLLABORATION

Presenter: BONIFAZI, Carla (ICAS-ICIFI-UNSAM/CONICET)

Session Classification: Experiments 6

Contribution ID: **58** Type: **Talk**

CYGNUS and laying the groundwork for the directional detection of CEνNS

Monday 9 June 2025 17:06 (18 minutes)

The directions of low energy nuclear recoils open windows into previously unprobed areas of physics. Specifically, directional detection of coherent elastic neutrino nucleus scattering (CEνNS) would probe for new, beyond-the-standard-model (BSM) gauge bosons involved in that interaction as well as provide a tool for distinguishing between dark matter and neutrino scattering. Currently the only detectors capable of time-resolved directional recoil detection are gaseous time projection chambers (TPCs). The CYGNUS collaboration develops gaseous time projection chambers (TPCs) with low energy thresholds and higher active volumes in pursuit of probing dark matter and neutrino physics. Our group at the University of Hawaii intends to demonstrate the first directional detection of CEνNS to date, at the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory (ORNL). This talk presents recent developments towards scaling our TPCs up to active volumes of order 〖1m〗^3, which is necessary for both directional CEνNS measurments and for dark matter searches. We present preliminary projections for our planned directional CEνNS measurement, and the first steps towards optimizing the gas mixture for that measurement.

Author: LITKE, Michael (University of Hawaii at Manoa)

Presenter: LITKE, Michael (University of Hawaii at Manoa)

Session Classification: Experiments 3

Contribution ID: **60** Type: **Talk**

NEP-ton and Plvt3o: Lead glass neutrino experiments at the SNS

Wednesday 11 June 2025 14:22 (18 minutes)

In 2015, the COHERENT collaboration attempted to measure the electron-neutrino charged current (CC) cross-section on lead. The Eljen cell and the Neutrino Cubes detectors hunted for the Neutrino Induced Neutrons (NINs) produced by this process. The results indicated a surprisingly small cross-section —less than one third of the predicted signals were observed. Understanding the NINs production rate is crucial for COHERENT, seeing as lead is a common shielding material for the detector subsystems used. To further investigate this curiosity, an upcoming experiment will search for this process by detecting only the resulting lepton produced, instead of the secondary neutron. Lead glass will be both the target material and the detection medium, which is made possible because it is transparent to the Cherenkov radiation produced by the lepton. The goal is to seek a concrete measurement of this cross-section using NEP-ton, a 640kg array of repurposed lead glass. Planning is also underway for Plvt3o, a multi-tonne lead glass detector, which will build on the initial deployment and will be able to perform a precision search for sterile neutrinos —a potential 4th generation of neutrinos.

Author: ZAALISHVILI, Ana (Duke University, Triangle Universities Nuclear Laboratory)

Presenter: ZAALISHVILI, Ana (Duke University, Triangle Universities Nuclear Laboratory)

Session Classification: Experiments 7

Contribution ID: **61** Type: **Talk**

Basic Aspects of Neutrino Physics

I will discuss a few aspects of electroweak theory relevant for neutrino scattering on different targets. The presentation will follow historical developments starting with the discovery of the neutron, the establishment of Fermi beta theory and finishing with the SM electroweak sector. A few aspects of effective theories will be covered. And an explicit calculation of the CEvNS cross section, using the hadron current multipole expansion, will be discussed.

Author: ARISTIZABAL, Diego (Universidad Tecnica Federico Santa Maria (USM))

Presenter: ARISTIZABAL, Diego (Universidad Tecnica Federico Santa Maria (USM))

Session Classification: Lectures 1

Contribution ID: **62** Type: **Talk**

Neutrino detection at low energies

In these lectures, I will discuss key milestones in neutrino physics, from the first detections to current large-scale experiments like DUNE. I will then present the main detector technologies used in neutrino research and the background challenges they face. Finally, I will review a decade of CEvNS experiments, from COHERENT to recent developments in CONUS.

Author: STRAUSS, Raimund Johann (Technische Universitaet Muenchen (DE))

Presenter: STRAUSS, Raimund Johann (Technische Universitaet Muenchen (DE))

Session Classification: Lectures 2

Contribution ID: **63** Type: **Talk**

Confidence intervals in particle physics

This three-lecture series will explore the construction and interpretation of confidence intervals within the context of particle physics. We will begin by defining the likelihood function and highlighting its central role in statistical inference. Through a concrete example, we will examine how the likelihood depends on the number of observed events, with special attention to the challenges and appropriate strategies in the low-statistics regime typical of particle physics experiments. We will then review various methods for constructing confidence intervals, comparing their assumptions and practical applications. Finally, we will discuss the connection between the likelihood function and the least-squares method, and how a quantity following a chi-squared distribution can be used to assess the significance of results or to set exclusion limits.

Author: RODRIGUES, Dario (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales y CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA). Buenos Aires, Argentina)

Presenter: RODRIGUES, Dario (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales y CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA). Buenos Aires, Argentina)

Session Classification: Lectures 1

Contribution ID: **64** Type: **Talk**

Numerical implementation of the CEvNS cross section

In the first part of this project nuclear form factor parametrizations will be discussed. That discussion will then be followed by the determination of neutrino fluxes from pion decay-at-rest and from nuclear reactors. The final part of the project will involve a full numerical implementation of the CEvNS cross section and the calculation of the event rate in both, fixed target and reactor facilities.

Author: ARISTIZABAL, Diego (Universidad Tecnica Federico Santa Maria (USM))

Presenter: ARISTIZABAL, Diego (Universidad Tecnica Federico Santa Maria (USM))

Session Classification: Projects 1

Contribution ID: **65** Type: **Talk**

Skipper-CCDs performance and data analysis

This two-session course will provide an in-depth exploration of Skipper-CCD detector performance and the techniques used to analyze their data. We will begin by reviewing the concept of noise in CCD detectors and how the Skipper architecture enables significant improvements in readout noise. Participants will learn how to quantify this noise using real images. We will then survey the various sources of single-electron events, and use real data to determine the dark current of the sensors and other contributions to the single-event background. The course will include a detailed study of sensor defects, such as hot pixels and hot columns, as well as the challenges posed by Charge Transfer Inefficiency and partial charge collection. Students will learn how to identify these effects and account for them in data analysis. A key focus will be the relationship between the event size and its depth within the sensor, and how this correlation can be exploited to define quality cuts. Finally, participants will gain hands-on experience in reconstructing energy spectra from real images, enabling them to set limits on the maximum number of events compatible with the targeted physical signals.

Author: RODRIGUES, Dario (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales y CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA). Buenos Aires, Argentina)

Presenter: RODRIGUES, Dario (Departamento de Física. Buenos Aires, Argentina, Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales y CONICET - Universidad de Buenos Aires, Instituto de Física de Buenos Aires (IFIBA). Buenos Aires, Argentina)

Session Classification: Projects 1

Contribution ID: **66** Type: **Talk**

Constraining BSM models with CEvNS data and exclusion limits

In this project, we will explore recent results from the CONUS+ experiment and examine how they can be used to constrain physics beyond the Standard Model. In particular, we will focus on scenarios involving non-standard neutrino interactions, neutrino magnetic moments, and light mediators. Our analysis will be guided by the framework and methodology presented in https://arxiv.org/abs/2501.17843, which provides a comprehensive study of these possibilities using CONUS+ data.

Author: PEREZ-GONZALEZ, Yuber F

Presenter: PEREZ-GONZALEZ, Yuber F

Session Classification: Projects 1

Contribution ID: **67** Type: **Talk**

Status of COH-Ar from the COHERENT Collaboration

Tuesday 10 June 2025 17:28 (18 minutes)

As part of the COHERENT collaboration's efforts toward precision CEvNS measurements since the first observation in 2017, COH-Ar-750 is the upcoming ton-scale liquid argon detector at Neutrino Alley, located at the Oak Ridge National Laboratory's Spallation Neutron Source (ORNL SNS). It will replace its smaller predecessor, the CENNS-10 detector, which first observed CEvNS on argon in 2019 and has since collected over three times the data reported in its initial publication. In this presentation, I will discuss the current status of the COH-Ar-750 detector and the ongoing efforts aimed at a first engineering run in 2026. I will also present progress toward a final CENNS-10 analysis based upon dataset with triple the integrated beam power of the original observation.

Author: LU, Jeremy

Presenter: LU, Jeremy

Session Classification: Experiments 5

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

Phenomenology/theory Summary

Wednesday 11 June 2025 16:00 (30 minutes)

Author: DORDEI, Francesca (INFN, Cagliari (IT))

Presenter: DORDEI, Francesca (INFN, Cagliari (IT))

Session Classification: Phenomenology/theory: Summary

Contribution ID: **69** Type: **not specified**

Experimental summary

Wednesday 11 June 2025 16:30 (30 minutes)

Author: GREEN, Matthew (NC State University)

Presenter: GREEN, Matthew (NC State University)

Session Classification: Experiments: Summary

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

Welcome

Monday 9 June 2025 09:00 (5 minutes)

Session Classification: Welcome

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

Workshop introduction

Monday 9 June 2025 09:05 (10 minutes)

Presenters: BONIFAZI, Carla (ICAS-ICIFI-UNSAM/CONICET); NASTEVA, Irina (Federal University of Rio de Janeiro (BR))

Session Classification: Welcome