XeSAT 2026 - International Workshop on Applications of Noble Gas Xenon to Science and Technology

Report of Contributions

Contribution ID: **1** Type: **Contributed talk**

The PETALO project

Tuesday, 19 May 2026 11:45 (15 minutes)

PETALO (Positron Emission TOF Apparatus with Liquid xenOn) is a project that uses liquid xenon (LXe) as a scintillation medium, silicon photomultipliers as a readout and fast electronics to provide a significant improvement in PET-TOF technology. Liquid xenon allows one to build a continuous detector with a high stopping power for 511-keV gammas. In addition, SiPMs enable a fast and accurate measurement of the time and energy with a small dark count rate at the low temperatures required from LXe. PETit, the first PETALO prototype built at IFIC (Valencia), consists of an aluminum box with one volume of LXe and two planes of VUV SiPMs, which register the scintillation light emitted in xenon by the gammas coming from a Na22 radioactive source placed in the middle. The LXe volume is divided in small, highly reflective cells to enhance light collection.
In this talk I will describe the PETALO concept and present the energy and time measurements performed with PETit.

Primary author: SALOR IGUIÑIZ, Nerea (DIPC & IFIC-UV)

Presenter: SALOR IGUIÑIZ, Nerea (DIPC & IFIC-UV)

Session Classification: Medical applications

Track Classification: Medical applications

Contribution ID: **3** Type: **Invited talk**

Ab initio theory towards reliable neutrinoless double beta decay nuclear matrix elements

Tuesday, 19 May 2026 14:00 (30 minutes)

As experiments searching for neutrinoless double beta decay with Xe136 are in the planning phase of a next generation with hopes to completely probe the inverted mass hierarchy, the need for reliable nuclear matrix elements, which govern the rate of this decay, is stronger than ever. Since a large discrepancy is found when computing this quantity with different nuclear models, a large unknown still exists on the sensitivity of these experiments to the effective neutrino mass. In this talk I will present how, using ab initio methods relying on systematic expansions, a rigorous statistical uncertainty can be achieved. I will detail how this uncertainty is obtained and what are the next step to improve on the current calculations.

Primary author: Dr BELLEY, Antoine (MIT)

Presenter: Dr BELLEY, Antoine (MIT)

Session Classification: DM - 0vBB

Track Classification: Theory

Contribution ID: **4** Type: **Invited talk**

Status and Upgrades of the DEAP-3600 Experiment

Thursday, 21 May 2026 08:30 (30 minutes)

The DEAP-3600 experiment at SNOLAB utilizes 3.3 tonnes of liquid argon to search for dark matter and rare nuclear processes. Benefiting from stable, low-background operation, the experiment is expanding its physics reach through advanced analysis and hardware improvements.

This talk presents the WIMP search status using the Profile Likelihood Ratio method. Leveraging 790.8 live-days of data, an updated background model, and increased fiducial volume, we aim to maximize sensitivity to the spin-independent WIMP-nucleon cross-section.

Simultaneously, DEAP-3600 searches for ^{8}B solar neutrino absorption on ^{40}Ar in the MeV scale. Identifying the resulting excited ^{40}K state would demonstrate liquid argon's suitability for solar neutrino spectroscopy. This requires precise understanding of high-energy backgrounds like radiogenic neutron capture and cosmogenic muons.

Finally, we will describe hardware upgrades for the upcoming campaign. Improvements like pyrene-doped polystyrene neck coating and enhanced filtration aim to mitigate alpha particle backgrounds, paving the way for improved future sensitivity.

Primary author: HUGUES, Theo (Queen's University)

Presenter: HUGUES, Theo (Queen's University)

Session Classification: Argon Experiments

Track Classification: Dark Matter

Contribution ID: **5** Type: **Invited talk**

New results from the MEG II experiment and liquid xenon calorimetry

Wednesday, 20 May 2026 09:00 (30 minutes)

The MEG II experiment has collected physics data since 2021 to search for the lepton-flavor-violating muon decay, $\mu^+ \to e^+\gamma$, with a target sensitivity of 6×10^{-14}. The latest result, based on the first two years of data, has achieved the most sensitive search to date. No signal excess was found, and the most stringent upper limit on the branching ratio was set to 1.5×10^{-13} at the 90% confidence level. We have developed the liquid xenon calorimetry to precisely measure 52.8 MeV γ-rays since the predecessor experiment, MEG. This presentation will give new results from the MEG II experiment and the technologies of liquid xenon calorimetry.

Primary author: YAMAMOTO, Kensuke (The University of Tokyo)

Presenter: YAMAMOTO, Kensuke (The University of Tokyo)

Session Classification: Precision Experiments

Track Classification: Precision experiments

Contribution ID: **6** Type: **Contributed talk**

Xenoscope: a vertical demonstrator for the XLZD observatory

Thursday, 21 May 2026 15:30 (15 minutes)

The XLZD (XENON-LZ-DARWIN) collaboration is developing the next-generation observatory for dark matter, neutrino and rare-event physics. The detector will use a dual-phase xenon time projection chamber (TPC) with 60 tonnes of active xenon in a volume of approximately 3 meters in both height and diameter.
Xenoscope, at the University of Zurich, is a vertical demonstrator built to address the technical challenges associated with the large scaling up with respect to current experiments. The facility hosts a 2.6 m tall TPC to study electron drift, diffusion, and light propagation in liquid xenon. It also serves as a test bench for hardware R&D such as characterising different coating materials or photosensor technologies.
In this talk I will present the Xenoscope facility and the results from the commissioning of the TPC and its first run, including the observation of correlated S1–S2 signals from cosmic muons.

Primary author: Dr CUENCA GARCIA, Jose (University of Zurich)

Presenter: Dr CUENCA GARCIA, Jose (University of Zurich)

Session Classification: Technology and R&D

Track Classification: Dark Matter

Contribution ID: **8** Type: **Invited talk**

An Overview of and Latest Results from the LUX-ZEPLIN Experiment

Tuesday, 19 May 2026 09:45 (30 minutes)

The LUX-ZEPLIN (LZ) experiment has been searching since 2021 for a form of dark matter known as weakly-interacting massive particles (WIMPs). LZ consists of a time projection chamber containing 7 tonnes of liquid xenon and is surrounded by a multi-layer veto to help reject backgrounds, and is located at the Sanford Underground Research Facility in South Dakota. Recently, using a 5.7 tonne-year exposure, LZ has placed stringent limits on the spin-independent WIMP-nucleon cross section in the 3-9 GeV/c^2 WIMP mass range in the presence of coherent elastic neutrino-nucleus scattering (CEνNS) from ^{8}B solar neutrinos. In this talk, I will review the LZ experiment and report on our recent science results. In particular, I will discuss the challenges associated with a near-energy-threshold search.

Primary author: Dr BIESIADZINSKI, Tomasz (SLAC National Accelerator Laboratory)

Presenter: Dr BIESIADZINSKI, Tomasz (SLAC National Accelerator Laboratory)

Session Classification: Overview and DM

Track Classification: Dark Matter

Contribution ID: **9** Type: **Invited talk**

Hardware Upgrades and Background Mitigation in DEAP-3600

Thursday, 21 May 2026 16:45 (30 minutes)

The DEAP-3600 experiment is one of the world's most sensitive liquid-argon (LAr) dark-matter search, operating 2 km underground at SNOLAB with a 3.3-tonne LAr target. The experiment continues to collect WIMP-search data and will resume extended data acquisition following completion of its current detector-upgrade campaign. In this talk, I will present a detailed overview of the recently completed hardware upgrades, the characterization of alpha-induced backgrounds in DEAP-3600, and data taken after the upgrades.

A central focus will be the characterization of alpha-induced backgrounds from the acrylic vessel and associated surfaces. Particular emphasis will be placed on the neck background population, originating from alpha decays on the flow-guide and adjacent surfaces where the optical geometry produces highly asymmetric light collection patterns. I will discuss how these populations are modeled, identified, and constrained within the full background framework.

I will then describe detector-upgrade measures that will have been completed prior to the conference and are targeted at mitigating both neck and dust-related alpha backgrounds. These include coating the neck flow guide with a slow wavelength shifter (Pyrene) to shift prompt alpha induced scintillation into a PSD-favorable regime, and installing a dedicated dust extraction pipe and recirculation line to remove alpha emitting particulates dispersed throughout the LAr volume. Such degraded alpha contaminated dust cannot be rejected through fiducialization or position reconstruction alone, making active removal essential.

These upgrades and associated performance studies provide key insights for next-generation detectors such as ARGO.

Primary authors: JIGMEDDORJ, Badamsambuu (Laurentian University); THE DEAP3600 COLLABORATION, on behalf of

Presenter: JIGMEDDORJ, Badamsambuu (Laurentian University)

Session Classification: Technology and R&D

Track Classification: Dark Matter

Contribution ID: **10** Type: **Invited talk**

Solar Neutrino Searches in the LUX-ZEPLIN (LZ) Experiment

Wednesday, 20 May 2026 10:00 (30 minutes)

Underground liquid xenon time-projection chambers (TPCs) offer a low-background environment, a key requirement to enable sensitive searches for possible dark matter interactions. Additionally, these same conditions make xenon TPCs excellent for the detection of solar neutrino events down to and even below the ~1 keV electron-equivalent scale. In this talk I describe the program of solar neutrino searches with the largest liquid-xenon TPC operated to date: the LUX-ZEPLIN experiment, located at the Sanford Underground Research Facility, USA.

Primary author: HOROHO, Tyler (University of Michigan)

Presenter: HOROHO, Tyler (University of Michigan)

Session Classification: Precision Experiments

Track Classification: Dark Matter

Contribution ID: **11** Type: **Invited talk**

Electroluminescence in Liquid Xenon and Its Applications

Tuesday, 19 May 2026 12:00 (30 minutes)

Electroluminescence (EL) in liquid xenon is receiving renewed attention as a low-noise, proportional signal amplification mechanism for noble-liquid detectors. Compared to traditional gas-phase EL, liquid-phase EL enables more flexible detector geometries, efficient charge extraction, and alternative optical readout schemes for single-phase noble-liquid time projection chambers.

In this talk, I will present recent R&D results on electroluminescence in liquid xenon, including measurements of EL onset, light yield, electron- and nuclear-recoil response, and field dependence under well-controlled electric-field configurations. I will discuss observed variations in EL performance and their implications for detector stability, background control, and scalability.

I will also describe how liquid-xenon EL can be exploited for enhanced charge readout in rare-event detectors, with particular emphasis on low-energy sensitivity and high-resolution signal reconstruction. Ongoing R&D efforts and open questions will be outlined, including optimization of EL yield, control of photon feedback, and integration with large-area photosensors. These results highlight the potential of liquid-phase electroluminescence as a practical and scalable technique for next-generation xenon-based detectors in both particle physics and applications.

Primary author: NI, Kaixuan (UC San Diego)

Presenter: NI, Kaixuan (UC San Diego)

Session Classification: Medical applications

Track Classification: Medical applications

Contribution ID: **12** Type: **Contributed talk**

Characterization of LXe Scintillation using VUV SiPMs in the Light-only Liquid Xenon (LoLX) Detector

Wednesday, 20 May 2026 12:30 (15 minutes)

The Light-only Liquid Xenon (LoLX) experiment, operating at McGill University and TRIUMF, characterizes liquid xenon (LXe) scintillation and silicon photomultiplier (SiPM) performance. The detector consists of a 4-cm cube instrumented with an array of HPK VUV4 and FBK HD3 SiPMs. In this work, we present detector response measurements using ^{133}Ba and ^{137}Cs gamma sources. We developed a GPU-based optical simulation using Chroma to train a machine learning model to reconstruct position and energy. We demonstrate that the method improves energy resolution. We report the resulting light yield and energy resolution, alongside a comparative analysis of the HPK VUV4 and FBK HD3 sensor performance for future LXe experiments.

Primary author: LI, Xiang (TRIUMF)

Co-author: RETIERE, Fabrice (TRIUMF)

Presenter: LI, Xiang (TRIUMF)

Session Classification: Technology and R&D

Track Classification: Neutrinoless double beta decay

Contribution ID: **14** Type: **Invited talk**

Status of the AXEL: 180L Prototype Results and Developments for the 1000L Detector

Thursday, 21 May 2026 13:00 (30 minutes)

The AXEL (A Xenon ElectroLuminescence) experiment aims to search for neutrinoless double beta decay ($0\nu\beta\beta$) using a high-pressure xenon gas time projection chamber (TPC).
The detector features a unique ionization detection called the Electroluminescence Light Collection Cell (ELCC), which provides high energy resolution and topological information by converting ionization electrons into electroluminescence light within cellular structures.

We have successfully operated an 180 L prototype detector and demonstrate the performance of this technology.
One of the recent key achievements is the development and installation of a Cockcroft-Walton (CW) multiplier for in-situ high voltage generation, addressing the difficulty of feeding high voltage (> 100 kV) into a high-pressure vessel.
The prototype demonstrated stable operation at 6.8~bar with the CW multiplier, achieving an energy resolution of 0.67 ± 0.08 % (FWHM) at 2615 keV.
Furthermore, the capability to reconstruct three-dimensional tracks was confirmed, allowing for topological discrimination between signal and background events, such as distinguishing single-electron events from pair-creation events.

Building on these results, we are currently constructing a 1000 L-scale detector to realize the first physics run for the $0\nu\beta\beta$ search.
We are developing a high-voltage distribution system that supplies voltage to ELCC modules independently; this minimizes the risk of total detector failure caused by localized discharges and allows for finer voltage adjustment.
Additionally, to reduce radioactive background contamination, we are developing a low-mass field cage utilizing flexible printed circuits (FPC), designed to prevent inter-electrode discharges and surface charging.
We are also developing a low-radioactivity Cockcroft-Walton circuit utilizing FPC capacitors, and a scintillation detection mechanism utilizing wavelength-shifting coating to realize a large photosensitive area and high detection efficiency.

In this presentation, we will report on the performance of the 180 L prototype, including the CW multiplier operation and tracking capabilities, and discuss the status of the new technologies being developed for the 1000 L detector.

Primary author: URANO, Soki (Tohoku University)

Presenter: URANO, Soki (Tohoku University)

Session Classification: DM - 0vBB

Track Classification: Neutrinoless double beta decay

Contribution ID: **15** Type: **Invited talk**

Overview of recent progress in PandaX experiment

Tuesday, 19 May 2026 13:30 (30 minutes)

PandaX (Particle and Astrophysical Xenon experiment), a large-scale liquid xenon dark matter detection project located at the China Jinping Underground Laboratory, has provided a high-sensitivity experimental platform for dark matter searches through the iterative development of three generations of detectors since its launch in 2009. It adopts the two-phase xenon time projection chamber technology, using xenon atoms as the detection target, and achieves detection by capturing the scintillation light and ionization signals generated by the collision between dark matter particles and xenon atoms. This report focuses on the recent progress in dark matter and neutrino physics searches with the PandaX-4T experiment as well as the development of the next-generation 20-ton liquid xenon experiment.

Primary author: ZHOU, Ning (Shanghai Jiao Tong University)

Presenter: ZHOU, Ning (Shanghai Jiao Tong University)

Session Classification: DM - 0vBB

Track Classification: Dark Matter

Contribution ID: **16** Type: **Contributed talk**

Used Nuclear Fuel as a Xenon Source

Tuesday, 19 May 2026 17:30 (15 minutes)

Decades of innovation have established xenon TPCs as a leading detector technology in the search for new physics in the form of Majorana neutrinos and WIMP-like dark matter. Searches for both phenomena have probed significant parameter space but have yet to make a discovery. To further augment sensitivity, new experiments will require greater xenon masses. While these two new physics channels have differing detector requirements, they have a common need for a large amount of xenon. This requirement for tons (even kilotons) of xenon drives up the cost of these experiments and makes their development susceptible to the waverings of a limited market of atmospheric-xenon.

An alternative source of xenon could be found in used nuclear fuel (UNF). Xenon is a dominant fission product and is present in UNF at concentrations thousands of times greater than in the atmosphere. Canada's fleet of CANDU reactors has been adding to UNF inventory for over half a century. In this talk, I will discuss the possibility of tapping into this resource and what potential steps may be required.

Primary author: ROSS, Regan (McGill University)

Presenter: ROSS, Regan (McGill University)

Session Classification: Industry

Track Classification: Industry

Contribution ID: **17** Type: **Invited talk**

The status of PandaX-20T time projection chamber development

Thursday, 21 May 2026 14:00 (30 minutes)

PandaX-4T is one of the most sensitive liquid xenon detectors, achieving world leading results in dark matter and neutrino physics. The construction of its successor, the next-generation detector PandaX-20T, will start in the beginning of 2026. Over 22 tonnes of xenon will be utilized, resulting in a diameter of ~2m and a height of ~2.5m for the time projection chamber (TPC). The TPC will be equipped with 1.85m-diameter mesh electrodes, wire electrodes, and flexible printed circuit board shaping rings to generate electric field required for signal production. The new R12699 photomultiplier tubes will be employed for photon detection. This talk will give an overview of the status of TPC development, performance of prototypes, and the simulated background composition of the detector.

Primary author: ZHANG, Minzhen (SJTU)

Presenter: ZHANG, Minzhen (SJTU)

Session Classification: DM - 0vBB

Track Classification: Dark Matter

Contribution ID: **18** Type: **Invited talk**

Instrumentation Development for XLZD - The Ultimate Liquid Xenon Rare Event Observatory

Thursday, 21 May 2026 13:30 (30 minutes)

XLZD will feature a next-generation dual-phase liquid xenon (LXe) time projection chamber (TPC) with a 60–80 tonne active target. Building on the experience made with the LZ and XENONnT experiments, the detector scales the current technology by more than a factor of 10 in mass. This scale-up will enable searches for weakly interacting massive particles down to the neutrino fog, as well as searches for neutrinoless double beta decay of Xenon-136 and other rare processes.

Achieving these physics goals requires overcoming substantial hardware and instrumentation challenges. The TPC must be scaled to nearly 3 m in diameter and 4 m in height, while simultaneously meeting stringent requirements on intrinsic radioactivity, in particular from Radon-222 and Krypton-85. This necessitates a focused research and development (R&D) program, for example: XLZD's TPC demands robust, low-radioactivity, electrodes and a high-voltage delivery system. Spurious electron emission from cathodic surfaces must be mitigated through optimized materials and surface treatments. The cryostat must minimize radon emanation while supporting ~100 tonnes of LXe, requiring advanced welding techniques and possibly surface coatings. Reducing backgrounds from radionuclide impurities will require online cryogenic distillation, thorough material selection and design optimisation, complemented by nested vetoes. The rate of accidental coincidences from lone S1 and S2 signals increase with volume, motivating dedicated R&D to reduce spurious pulses.

This talk will summarize the R&D carried out so far within the XLZD collaboration and provide an outlook on the remaining work required to ensure technological readiness for an ultimate-scale LXe observatory.

Primary author: Dr DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Presenter: Dr DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Session Classification: DM - 0vBB

Track Classification: Dark Matter

Contribution ID: **19** Type: **Invited talk**

Latest results and status of the XENONnT experiment.

Tuesday, 19 May 2026 10:15 (30 minutes)

Despite overwhelming astronomical evidence for the existence of dark matter (DM), its fundamental nature remains one of the central open questions in modern physics. Owing to their excellent detection efficiency, scalability, and ultra-low background levels, dual-phase time projection chambers (TPCs) employing multi-tonne liquid xenon (LXe) targets are at the forefront of the search for GeV-scale DM in the form of weakly interacting massive particles (WIMPs). These detector capabilities further enable sensitivity to a broad range of rare and low-energy phenomena, including rare processes and studies of solar neutrinos and their properties.
The XENONnT experiment, operated by the XENON Collaboration, is an 8.5-tonne LXe TPC located at the Laboratori Nazionali del Gran Sasso (LNGS). In this talk, we present an overview of the current status of the experiment and summarize its latest results.
This work of the author is supported by the BMBF through the project numbers 05A23PM1.

Primary author: WENZ, Daniel (University of Muenster)

Presenter: WENZ, Daniel (University of Muenster)

Session Classification: Overview and DM

Track Classification: Dark Matter

Contribution ID: **20** Type: **Invited talk**

XLZD - Overview and Physics Potential

Friday, 22 May 2026 09:30 (30 minutes)

The XLZD Collaboration is developing the next generation large low background xenon experiment with the aim to search for WIMP dark matter into the neutrino-fog. The proposed instrument also provides myriad scientific opportunities in neutrino physics; for instance the search for neutrinoless double beta decay and astrophysical neutrino phenomena. XLZD's design is a ≥ 60-tonne active xenon dual-phase time projection chamber, pulling from the heritage of XENONnT and LUX-ZEPLIN experiments currently operating ~10-tonne detectors using this technology, and the R&D performed by the DARWIN and nEXO collaborations. A 100-tonne detector with 1000 tonne-years exposure would be the definitive DM experiment, pushing the 3σ discovery potential down to 3×10^{-49} cm^2 at 40 $\mathrm{GeV/c}^2$, the systematic limit imposed by astrophysical neutrinos. Studies are presently ongoing to push XLZD's neutrinoless double beta decay sensitivity using natural xenon, with 9% ^{136}Xe, above 10^{28} year half-live. This talk will give an overview of XLZD, and cover its rich physics potential.

Primary authors: MONG, Brian (SLAC); COLLABORATION, XLZD

Presenter: MONG, Brian (SLAC)

Session Classification: DM - 0vBB

Track Classification: Dark Matter

Contribution ID: **21** Type: **Invited talk**

The DarkSide-20k Program

Thursday, 21 May 2026 09:00 (30 minutes)

The search for the nature of Dark Matter remains a major goal of modern physics. DarkSide-20k, now under construction at the Laboratori Nazionali del Gran Sasso, is a 50-tonne dual-phase underground-argon double-phase Time Projection Chamber designed to achieve a background-free exposure of 200 tonne-years. Thanks to argon's strong pulse-shape discrimination, all conventional backgrounds are highly suppressed, leaving only a small irreducible contribution from coherent elastic neutrino–nucleus scattering, expected at the level of 4–5 events. The readout system consists of large-area silicon photomultiplier arrays for precision light and charge readout. The experiment aims to reach a WIMP–nucleon cross-section sensitivity of order $10^{-48}\,\mathrm{cm}^2$ at a 1 TeV/c^2 mass. This talk will present the scientific motivation, detector concept, and current status of the experiment.

Primary author: FIORILLO, Giuliana (Federico II University & INFN, Naples)

Presenter: CALABRESE, Roberta

Session Classification: Argon Experiments

Track Classification: Dark Matter

Contribution ID: **22** Type: **Invited talk**

XEMIS2 : Current status, results and outlooks

Tuesday, 19 May 2026 11:15 (30 minutes)

The XEMIS2 medical imaging device is a liquid Xenon (LXe) time projection chambre operating as a Compton telescope installed at Nantes University Hospital, France. XEMIS2 has started its commissioning in 2025 thanks to the commitment of technical and research teams of Subatech Laboratory (Nantes, France). After an overview of the XEMIS2 installation, this talk will present the first operation of the completely autonomous Xenon liquefaction and purification system with the detector fully assembled, the characterization of the light and charge data acquisition system at room and LXe temperature and preliminary LXe purity assessments. This milestone marks the beginning of a rich scientific program with the characterization and imaging of very low-activity sources emitting 1, 2 and 3 high-energy gamma-rays. In this context, the outlooks about XEMIS2 exploitation will be presented.

Primary author: BOSSIS, Théo (Subatech, CNRS/IN2P3, IMT Atlantique, Nantes Université)

Co-authors: Mr HERVO, Amaury (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr RENARD, Christophe (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Dr GIOVAGNOLI, Debora (DSD, IMT Atlantique Brest); Dr THERS, Dominique (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr MORTEAU, Eric (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Dr KRAEBER-BODÉRÉ, Françoise (CHU de Nantes); Dr LEFEVRE, Frédéric (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Dr BENABILES, Halim (IMT Nord Europe Lille); Mr BÉNEY, Jean-Luc (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr STUTZMANN, Jean-Sébastien (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Dr IDIER, Jérôme (LS2N, Nantes Université, Centrale Nantes, IMT Atlantique, CNRS, INRIA CNRS); Dr CHÉREL, Michel (CRCI2NA –INSERM); Dr BEAUPÈRE, Nicolas (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr LEMAIRE, Olivier (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr PICHOT, Patrice (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Mr LERAY, Patrick (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université); Dr STUTE, Simon (CRCI2NA –INSERM); Dr CARLIER, Thomas (CRCI2NA –INSERM); Dr JAOUEN, Vincent (LaTIM, IMT Atlantique Brest, INSERM, Université de Bretagne Occidentale); Mr RAMSI, Yohann (Subatech, IMT Atlantique Nantes, CNRS/IN2P3, Nantes Université)

Presenter: BOSSIS, Théo (Subatech, CNRS/IN2P3, IMT Atlantique, Nantes Université)

Session Classification: Medical applications

Track Classification: Medical applications

Contribution ID: **24** Type: **Poster**

The measurement of Krypton in Xenon with ppq sensitivity

Tuesday, 19 May 2026 18:50 (1 hour)

Krypton-85 beta decay is a significant background for liquid-xenon time projection chambers used in dark-matter searches. As the concentration of krypton in xenon reaches lower levels in current and next-generation detectors, the direct measurement of trace krypton in xenon becomes increasingly challenging. I report on the development of an enhanced krypton-concentration measurement technique that combines xenon freezing with ion counting to achieve a projected sensitivity better than one part per trillion.

Primary author: XU, Dacheng

Presenter: XU, Dacheng

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology

Contribution ID: **25** Type: **Invited talk**

Exploring Zeolites as Radon Adsorbents in Noble Gas Experiments

Tuesday, 19 May 2026 18:50 (1 hour)

Dark matter constitutes most of the universe's mass, yet its interactions remain elusive due to its weak coupling to the visible spectrum, necessitating innovative detection methods. Weakly interacting massive particles (WIMPS), are a promising dark matter candidate, and are theorized to interact with standard model particles via nuclear recoiling. At the forefront of investigating this interaction are liquid noble gas detectors, which are deep underground vessels filled with liquid argon (LAr) or xenon (LXe), surrounded by photosensors. Future large-scale detectors, are investigating the use of xenon doped argon, to increase light yield from recoils. However, radon decay chains pose a challenge, as radon bonds with noble gases via van der Waals forces, generating false signals that obscure rare event identification. For gasses like argon, this is approached by using activated charcoal as a radon absorbent, but for xenon, which has a comparable size to radon, its own molecules risk adsorption as well. To remove radon from xenon, large, expensive, cryogenic distillation facilities have been used, which have been found to be quite effective. However, new adsorption mediums have recently been introduced in the form of zeolites, which have been shown to be more effective adsorbents than activated charcoal for a variety of carrier gasses and temperatures. This talk will go into exploring the use of silver-zeolites as a cheap and efficient adsorbent for radon in carrier noble gasses.

Primary authors: LAI, Michela (Queen's University); CURTIS, Ryan (Queen's University)

Presenter: CURTIS, Ryan (Queen's University)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology

Contribution ID: **26** Type: **Invited talk**

Advancing High-Voltage Technologies for Large-Scale Liquid Xenon Detectors with the MOTION experiment

Tuesday, 19 May 2026 16:00 (30 minutes)

Next-generation liquid xenon (LXe) Time Projection Chambers (TPCs) for WIMP dark matter searches aim to double their drift length compared to current detectors. This scale-up introduces not only mechanical and production challenges but also pushes into largely unexplored territory: the interplay between conductors, LXe, and high voltage (HV) in ultra-pure environments.
MOTION, a 70 kg LXe TPC at the Karlsruhe Institute of Technology, serves as a dedicated platform to probe these frontiers. Designed to operate at voltages up to −200 kV, MOTION enables systematic studies of dielectric breakdown in LXe under controlled conditions, identifying factors that trigger and propagate discharges. Beyond breakdown physics, the detector facilitates investigations of spurious electrode emissions after surface treatments and supports the development of HV feedthroughs constructed exclusively from radiopure materials. These insights are critical for ensuring the stability and scalability of next-generation dark matter detectors.

Primary author: BIONDI, Yanina (Karlsruhe Institute of Technology)

Presenter: BIONDI, Yanina (Karlsruhe Institute of Technology)

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **27** Type: **Invited talk**

Recent results and plans for NEXT

Tuesday, 19 May 2026 15:00 (30 minutes)

Searches for neutrinoless double-beta decay (0νββ) represent one of the most promising avenues for uncovering new frontiers in particle physics, particularly in understanding the true nature of the neutrino. The Neutrino Experiment with a Xenon TPC (NEXT) investigates 0νββ using a high-pressure Xenon time projection chamber. This technology offers excellent energy resolution and good imaging capabilities.

The NEXT-100 detector, holding up to 100 kg of Xenon at 15 bar, is now taking data at the Canfranc Underground Laboratory. The main goal of NEXT-100 is to demonstrate the scalability of the technology. In this talk, I will review the latest results from this detector. I will also discuss the plans for the next-generation experiment.

Primary author: GUENETTE, Roxanne (University of Manchester)

Presenter: GUENETTE, Roxanne (University of Manchester)

Session Classification: DM - 0vBB

Track Classification: Neutrinoless double beta decay

Contribution ID: **28** Type: **Contributed talk**

Characterizing infrared scintillation light in xenon

Wednesday, 20 May 2026 12:45 (15 minutes)

Xenon, in both gaseous and liquid phases, is an excellent target material for rare-event searches due to its excellent scintillation properties. While ultraviolet (UV) scintillation in xenon is well established and widely exploited in current detectors, scintillation in the infrared (IR) remains largely unexplored. This contribution presents recent progress in the characterization of xenon IR scintillation, which is essential for assessing its potential in future high-precision detectors.

Measurements were performed using dedicated experimental setups and show promising results for detector applications. Systematic studies in gaseous xenon reveal a substantial IR light yield of approximately 6000 photons/MeV, comparable in magnitude to that of UV scintillation. For the first time, the time response of the IR emission was measured, finding a dominant microsecond-scale component that challenges existing models of xenon de-excitation pathways. In addition, a dual-phase xenon time projection chamber with broadband sensitivity from the UV to the IR was operated, yielding signals consistent with IR scintillation in both the liquid and gaseous phases.

Primary author: HAMMANN, Robert (Max-Planck-Institut für Kernphysik (MPIK))

Presenter: HAMMANN, Robert (Max-Planck-Institut für Kernphysik (MPIK))

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **29** Type: **Invited talk**

Unifying the community to realize a next-generation Xe rare-event search

Friday, 22 May 2026 10:00 (30 minutes)

The search for neutrinoless double-beta decay (0νββ) remains one of the most compelling frontiers in contemporary physics, offering a unique path to uncovering the Majorana nature of neutrinos and potentially providing an avenue towards explaining the observed matter dominance in our Universe. One of the most compelling elements for this search is xenon-136, deployed in a time-projection chamber. The strength of this technology is that the target mass can be scaled to tons and even tens of ton scales. The possibility to control the isotopic loading of xenon enables a staged approach starting with natural xenon that is later replaced with enriched xenon, enhancing the scientific reach of the second stage.

Xenon detector technology has been well established and several liquid xenon detectors of a few tons of Xe are currently searching for signatures of Dark Matter. At least two proposals aim to scale up these searches to a few tens of tons of liquid xenon. These Dark Matter detectors will also reach a significant sensitivity to neutrinoless double beta decay.

A challenge in the realization of Xe-based next-generation experiments, besides technical scaling, is their significant cost. I will present a personal perspective on a unified path toward sensitivities towards the 10^28 year regime, arguing that the xenon community must converge on shared goals, assess technical readiness for next-generation detectors, and pursue targeted R&D. A united community can realize a coherent, collaborative xenon program capable of delivering transformative discoveries in neutrino and dark matter physics.

Primary author: BRUNNER, Thomas (McGill/TRIUMF)

Presenter: BRUNNER, Thomas (McGill/TRIUMF)

Session Classification: DM - 0vBB

Track Classification: Neutrinoless double beta decay

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

Simulating scintillation light transport in a ton-scale LXe detector

Tuesday, 19 May 2026 18:50 (1 hour)

Accurate modelling of scintillation light transport is critical for the design, calibration, and reconstruction performance of ton-scale liquid xenon detectors. Current optical simulations tools based on CPU-driven Geant4 workflows are often slow to iterate on, with substantial start-up overhead, and quickly become computationally intractable with high statistics requirements.

We present a GPU-accelerated optical photon simulation toolkit developed for large LXe detectors, built on the open-source Chroma ray-tracing framework. Detector geometries are imported directly from CAD via STL files, with photosensor definitions and optical material properties configured through YAML inputs. The framework supports a range of relevant photon sources, including lasers, diodes, Cherenkov emitters, and scintillation photon generation using NEST, and can optionally ingest track information from Geant4 for detailed reconstruction studies. We further include a Monte Carlo–based SiPM response model incorporating correlated noise effects and a two-dimensional SiPM photon detection efficiency model benchmarked against measurements in liquid xenon and vacuum. We show current performance and applications, and discuss plans to release the toolkit as an open-source resource for the community, enabling rapid startup simulations and the generation of high-statistics light maps for fast simulation response models.

Primary authors: LI, Alex; GALLACHER, David

Presenter: GALLACHER, David

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology

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

Measuring the photon detection efficiency of VUV-sensitive digital SPAD arrays at TRIUMF

Tuesday, 19 May 2026 18:50 (1 hour)

The high-efficiency detection of vacuum ultraviolet (VUV) photons is essential to the operation of particle physics detectors employing LXe as a scintillator. Silicon photomultipliers (SiPMs) have been selected as the photon detector of choice for current LXe experiments such as MEG II, as well as future detectors such as nEXO and PIONEER, due to their high radiopurity, fast timing performance, and compact form factor. SiPMs will also be employed in LAr experiments such as DUNE and Darkside-20K. Recent R&D efforts to enable these experiments have produced SiPMs which detect LXe scintillation light at 175nm. However, currently available VUV-SiPMs employ an 'analog'structure, in which the outputs of all SPAD pixels are connected together as one channel. This talk will present the first measurements of the detection of VUV light using a digital SPAD array, in which individual SPAD pixels are controlled and read out individually. Developing SiPMs which operate using a digital architecture will facilitate future detectors, which are likely to employ tens of thousands of SiPMs, by simplifying DAQ for large numbers of channels, reducing power consumption, and allowing for on-chip signal processing and filtering. The devices tested are SPADs on a 2-D digital array platform, developed by the University of Sherbrooke as a testbed for technologies to be implemented on a fully 3-D integrated platform. Broadband photon detection efficiency (PDE) measurements have been performed using facilities at TRIUMF for wavelengths from 150-830nm. Devices have been tested with a bare silicon surface, with an SiO2 passivation layer, and with MBE surface treatments. Results indicate that, at 175 and 150nm respectively, PDE of ~17% and ~15% can be achieved using a bare silicon surface, with MBE treatment increasing efficiency to ~19% and ~24%. This performance is comparable to commercially available analog VUV-SiPMs. We will also describe the existing VUV characterization capabilities at TRIUMF and the new facilities currently under development, which will incorporate an ultrafast pulsed laser operating at VUV wavelengths.

Primary authors: Dr TURALA, Artur (Université de Sherbrooke); LEWIS, Harry (TRIUMF); DESHAIES, Jérôme (Université de Sherbrooke)

Co-authors: DE LAZZARI, Brandon (TRIUMF); RETIERE, Fabrice (TRIUMF); Dr VACHON, Frédéric (Université de Sherbrooke); RAYMOND, Kurtis (TRIUMF/SFU); KOULOUSOUSAS, Seraphim (Royal Holloway University of London); CHARLEBOIS, Serge (Université de Sherbrooke)

Presenter: LEWIS, Harry (TRIUMF)

Session Classification: Welcome Reception (dinner) & Poster session

Contribution ID: **32** Type: **Invited talk**

Potential of Digital SiPM for light detection in Xenon based applications

Thursday, 21 May 2026 11:00 (30 minutes)

Digital SiPMs are a technology were single-photon avalanche diodes (SPADs) and their CMOS readout electronics are on the same chip. This approach reduces system complexity, which improves radio purity, and allowing the readout to be tailored to the experiment. The SPAD quality improved in recent years to the point where their performance in terms of dark count rate, quantum efficiency and crosstalk are comparable to traditional analog SiPMs. However, issues such as the lack of sensitivity for very short wavelength UV light still need to be solved. We discuss the opportunities and challenges associated with Digital SiPMs operated as light detector in Xenon and present a chip with an architecture designed for rare event search with liquid Xenon. The chip offers a very high fill factor of over 70%, high position resolution and the possibility of light imaging. The digital readout of the chip can process both short intense bursts of photons as well as a weak constant fluxes. A simple serial data protocol reduces the number of pads and thus cables and multiple chips can be daisy chained to form compact and dens detector modules that are controlled with less than ten cables.

Primary author: KELLER, Michael (Heidelberg University)

Co-author: Prof. FISCHER, Peter (Heidelberg University)

Presenter: KELLER, Michael (Heidelberg University)

Session Classification: Photosensors

Track Classification: Overview

Contribution ID: **33** Type: **Invited talk**

Performance of Large-Scale Xenon Doping Liquid Argon in ProtoDUNE

Thursday, 21 May 2026 16:15 (30 minutes)

The Deep Underground Neutrino Experiment (DUNE) employs large liquid argon time projection chambers (LArTPCs) to address key questions in neutrino physics and astroparticle physics. Efficient detection of scintillation light is essential for event timing, triggering, and low-energy physics, motivating studies of liquid argon doped with xenon as a wavelength-shifting and light-enhancing medium. This presentation summarizes the xenon-doping studies performed in the ProtoDUNE Single-Phase detector at CERN in 2020. Xenon was injected at concentrations up to tens of parts per million, allowing the first systematic investigation of xenon-doped liquid argon scintillation in a kiloton-scale detector. Results on light yield, pulse-shape evolution, and response uniformity are presented, including effects observed under nitrogen contamination and the extent to which xenon mitigates quenching. The results demonstrate the feasibility and stability of xenon doping in a large detector volume and provide important input for the design of future DUNE photon detection systems. We conclude with a brief overview of the extension of this program to ProtoDUNE-VD, the vertical drift prototype.

Primary author: SOUZA, Henrique (INFN - Milano Bicocca)

Presenter: SOUZA, Henrique (INFN - Milano Bicocca)

Session Classification: Technology and R&D

Track Classification: Overview

Contribution ID: **34** Type: **Invited talk**

The LXe detector R&D for the PIONEER experiment

Wednesday, 20 May 2026 09:30 (30 minutes)

The PIONEER experiment aims to perform precision tests of lepton flavor universality through measurements of rare pain decays using a stopped-pion technique. Achieving the targeted sensitivity requires excellent control of systematic effects, high energy and timing resolution, and robust pile-up rejection under high-rate conditions.
Liquid xenon calorimetry offers attractive performance characteristics for meeting these requirements, including high light yield, fast response, and homogeneous energy measurement.
The LXe approach still requires experimental demonstration under PIONEER-specific conditions, including studies of MPPC PDE degradation, the development of thin windows with thin Chip-on-Film MPPC designs, and detailed measurements and simulations of the achievable resolution and pile-up rejection capabilities.
This talk will present the current general status of the PIONEER experiment and of the LXe detector R&D and discuss its role within the broader PIONEER detector strategy.

Primary author: IWAMOTO, Toshiyuki (The University of Tokyo)

Presenter: IWAMOTO, Toshiyuki (The University of Tokyo)

Session Classification: Precision Experiments

Track Classification: Precision experiments

Contribution ID: **35** Type: **Invited talk**

Global Underground Science Infrastructure: Enabling Xenon-Based Experiments

Friday, 22 May 2026 11:00 (30 minutes)

Xenon-based experiments searching for dark matter and rare nuclear processes rely on ultra-low-background underground laboratories. This talk provides a global overview of these facilities, highlighting depth, shielding, and support infrastructure. We will examine how underground capabilities enable cutting-edge xenon science and foster international research opportunities.

Primary author: COOLEY, Jodi (SNOLAB)

Presenter: COOLEY, Jodi (SNOLAB)

Session Classification: Underground Facilities

Track Classification: Overview

Contribution ID: **37** Type: **Invited talk**

XeLab: Electrode Studies for Future LXe TPCs

Tuesday, 19 May 2026 16:30 (30 minutes)

With the increasing size of dual-phase liquid xenon time projection chambers (LXe TPCs), several technological challenges arise, in particular concerning the scalability and stability of high-voltage electrodes. Large-area electrodes are increasingly exposed to mechanical sagging, electrostatic distortions, and backgrounds from spurious electron emission.

The XeLab project addresses these challenges by developing an original concept of spacer-assisted floating electrodes (SAFE) for efficient electron extraction, which introduce mechanically supported structures into the conventional gate–anode system. In this approach, electrode planarity is ensured by insulating spacers and an optimised balance of forces at the liquid–gas interface.

The construction of the XeLab cryogenic system and its dual-phase TPC has been completed. Novel cooling systems based on liquid nitrogen, together with a fully open slow-control architecture, have been commissioned and are now operational. We will present the current status of the XeLab facility and ongoing studies on novel electrode concepts.

Primary author: XING, Yajing (LPNHE-Sorbonne Université)

Presenter: XING, Yajing (LPNHE-Sorbonne Université)

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **38** Type: **Invited talk**

Upgrade of the XENONnT experiment with new electrodes

Tuesday, 19 May 2026 17:00 (30 minutes)

The XENONnT experiment, operating at the INFN Gran Sasso Laboratory, continues its search for rare events using a dual-phase xenon time projection chamber (TPC) containing $5.9\,\mathrm{t}$ of xenon inside the detector cryostat. Recent results include new limits on WIMP dark matter based on a 3.1 tonne-year exposure, as well as the first indication of solar ^{8}B neutrino interactions via coherent elastic neutrino–nucleus scattering.

After several years of stable operation, XENONnT underwent in 2025 a major hardware upgrade campaign focused on replacing the TPC's electrodes. The former wire-grid cathode was substituted with a photochemical etched hexagonal mesh, while the anode design was modified to sustain higher wire tension. These new electrodes aim to enable significantly higher drift and extraction fields within the TPC, enhancing the experiment's sensitivity. Extensive electrode development and testing, including operation in liquid xenon, preceded the installation. Alongside this major intervention, additional infrastructure upgrades were carried out, most notably the commissioning of a gadolinium recovery plant for the experiment's water-Cherenkov neutron veto.

This contribution will introduce key features of the experiment's instrumentation. Furthermore, we will cover the new electrodes'design, production and testing, their expected impact on detector performance, and the integration schedule toward XENONnT's next data taking campaign.

Primary author: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Presenter: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Session Classification: Technology and R&D

Track Classification: Overview

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

The Key to a Background-Free $0\nu\beta\beta$ Search in Liquid Xenon: Ba-Tagging - Status and Prospects

Tuesday, 19 May 2026 18:50 (1 hour)

Barium tagging ("Ba-tagging") has the potential to become a defining technology for next-generation liquid and gas xenon time projection chambers searching for neutrinoless double-beta decay ($0\nu\beta\beta$) in ^{136}Xe. The successful identification of the $\beta\beta$-decay daughter ^{136}Ba at the reconstructed decay site would provide an event-by-event confirmation of the parent decay isotope ^{136}Xe and enable unprecedented background rejection. This capability could allow experiments such as nEXO to operate in a near background-free regime at the multi-tonne scale.
We review ongoing efforts in barium ion localization, extraction, isolation and trapping strategies aimed at single-ion identification. We present the current status, highlighting the recent progress made by the Ba-tagging research and development program for nEXO. Finally, we outline the near-term milestones and the pathway toward demonstrating a complete Ba-tagging system to benchmark the maximum deliverable tagging-efficiency.

Primary authors: RASIWALA, Hussain (McGill University); BRUNNER, Thomas (McGill/TRIUMF)

Co-authors: KWIATKOWSKI, Anna (TRIUMF); LENNARZ, Annika (TRIUMF); RAY, Dwaipayan; Mr COULTHARD, Ethan (McGill University); MARQUIS, Megan (McMaster University/TRIUMF)

Presenter: RASIWALA, Hussain (McGill University)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Neutrinoless double beta decay

Contribution ID: **40** Type: **Poster**

Status of the MainzTPC Upgrade for Precision Low-Energy Recoil Measurements in Liquid Xenon

Tuesday, 19 May 2026 18:50 (1 hour)

The MainzTPC is an experimental dual-phase xenon time projection chamber (TPC) dedicated to the study of scintillation and ionization processes in liquid xenon (LXe) for low-energy electronic and nuclear recoils. It has been designed to be the primary target in Compton and neutron scattering experiments to measure recoil energies in LXe down to 1 keV.

To improve position resolution in x and y, the MainzTPC was redesigned to accommodate an array of 36 individually read-out silicon photomultipliers (SiPMs) in place of its monolithic top photomultiplier tube (PMT) and eight avalanche photodiodes. A primary goal of this upgrade is to enable sensitive measurements of low-energy nuclear recoils in LXe, in particular of the Migdal effect.

For this purpose, dedicated simulations of the detector response were performed. Additionally, a cryogenic amplifier board housing the SiPM array was developed and built. To address known instabilities in the liquid level, we rebuilt the level meters and level control based on camera observations of the liquid-gas interface. We report on the status of this work.

Primary author: Mr SZYSZKA, Constantin (Johannes Gutenberg-Universität Mainz)

Co-authors: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz); Dr HILS, Christopher (Johannes Gutenberg-Universität Mainz); MERZ, Johannes (Johannes Gutenberg-Universität Mainz); Mr GYÖRGY, Peter (Johannes Gutenberg-Universität Mainz); Prof. OBERLACK, Uwe (Johannes Gutenberg-Universität Mainz)

Presenter: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology

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

Underground Facility Panel

Friday, 22 May 2026 11:30 (1 hour)

Session Classification: Underground Facilities

Contribution ID: **42** Type: **Poster**

Development of a Xenon Purity Monitor

Tuesday, 19 May 2026 18:50 (1 hour)

Monitoring impurity levels within a noble liquid detector is essential for achieving precise energy measurements and for producing accurate detector simulations by including corrected light transport properties. PUMA (purity monitor assembly) is being developed at TRIUMF by the PIONEER group to monitor impurities in liquid xenon. PUMA can measure electronegative impurities, such as oxygen or water, which are two of the most prevalent impurities in LXe detectors and have a big impact on the attenuation of vacuum ultraviolet light. This poster will cover the function of PUMA, test results from data collected at TRIUMF, PSI and McGill, as well as the development of an improved apparatus for an absolute impurity measurement using an external source.

Primary author: KLEMETS, Emma (TRIUMF)

Presenter: KLEMETS, Emma (TRIUMF)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Precision experiments

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

Welcome

Tuesday, 19 May 2026 09:00 (15 minutes)

Presenter: MALBRUNOT, Chloé (TRIUMF)

Session Classification: Overview and DM

Contribution ID: **44** Type: **Invited talk**

KAMLAND-Zen Experiment Talk

Tuesday, 19 May 2026 14:30 (30 minutes)

(placeholder)

Presenter: MIYAKE, Haruhiko (Research Center for Neutrino Science, Tohoku University)

Session Classification: DM - 0vBB

Contribution ID: **47** Type: **Invited talk**

Argo Experiment Talk

Thursday, 21 May 2026 09:30 (30 minutes)

(placeholder)

Presenter: BOULAY, Mark

Session Classification: Argon Experiments

Contribution ID: **48** Type: **Invited talk**

VUV phototubes & SiPMs Talk

Thursday, 21 May 2026 10:30 (30 minutes)

(placeholder)

Presenter: MIHARA, Satoshi (KEK)

Session Classification: Photosensors

Contribution ID: **49** Type: **Invited talk**

Overview 0vBB Talk

Friday, 22 May 2026 09:00 (30 minutes)

Presenter: SMITH, Nigel (TRIUMF)

Session Classification: DM - 0vBB

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

Calibration Sources for the Light-only Liquid Xenon (LoLX) Detector

Tuesday, 19 May 2026 18:50 (1 hour)

Some of the most sensitive detectors used for low-background searches, such as dark matter and neutrinoless double beta decay, are liquid xenon-based detectors. These require stringent background discrimination and mitigation, and silicon photomultipliers (SiPMs) present a promising alternative to traditional photomultiplier tubes (PMTs) due to their lower levels of radioactivity. In order to characterize SiPM performance, the Light-only Liquid Xenon (LoLX) collaboration makes use of a cubic configuration of 80 SiPMs to perform comparative studies of two different sensor manufacturers, Fondazione Bruno Kessler and Hamamatsu, as well as a PMT for light monitoring. LoLX 2 is designed to operate in approximately 5 kg of liquid xenon (LXe), and provides a means to study Cherenkov and scintillation light production in the medium. In the previous iteration of the detector, LoLX 1, a strontium-90 needle was positioned inside the geometry and used as a beta source to study LXe cherenkov light production within an octagonal configuration of Hamamatsu SiPMs. This poster provides an overview of several additional calibration sources used for light yield and energy resolution studies, including various gamma sources, as well as a hafnium-181 point-like source located within the center of the LoLX 2 configuration for position-independent analyses. This poster also explores the potential use of a liquid xenon mixture incorporating xenon-127 gas for monitoring of long-term SiPM stability and performance.

Primary author: NITU, Irina (McGill University)

Presenter: NITU, Irina (McGill University)

Session Classification: Welcome Reception (dinner) & Poster session

Contribution ID: **52** Type: **Invited talk**

R&D on LXe TPC

Wednesday, 20 May 2026 11:00 (30 minutes)

(placeholder)

Presenter: BARBERIO, Elisabetta

Session Classification: Technology and R&D

Contribution ID: **53** Type: **Invited talk**

Purification of xenon for the next generation of xenon experiments

Thursday, 21 May 2026 15:00 (30 minutes)

Next-generation xenon experiments designed to search for dark matter and neutrinoless double beta decay, such as XLZD, require even lower concentrations of electronegative impurities and radioactive noble gases such as argon, krypton and radon in the xenon target. The levels of electronegative impurities must be so low that electrons in LXe can drift over a distance of 3 m without significant loss. For radioactive noble gases, their concentrations –based on impurity levels corresponding to the solar neutrino rate at XENONnT [1] –must be reduced by a further order of magnitude through even better shielding, material selection and detector design, as well as through scalable technologies and new purification methods. In addition, the sensitivity in measuring the various concentrations within the detector must be improved. This talk will present the current status and results of LowRad [2] as well as other R&D projects.

[1] E. Aprile et al. [XENON Collaboration], Radon Removal in XENONnT down to the Solar Neutrino Level, Phys. Rev. X 15 (2025) 031079
[2] ERC Advanced Grant project 101055063: LowRad (Low radon and low internal radioactivity for dark matter and rare event xenon detector)

Primary author: WEINHEIMER, Christian

Presenter: WEINHEIMER, Christian

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **55** Type: **Invited talk**

Messer Talk

Tuesday, 19 May 2026 18:15 (15 minutes)

(Industry talk placeholder)

Session Classification: Industry

Contribution ID: **56** Type: **Invited talk**

Air Liquide Talk

Tuesday, 19 May 2026 18:30 (15 minutes)

(Industry talk placeholder)

Session Classification: Industry

Contribution ID: **57** Type: **Poster**

Light-only Liquid Xenon Detector Hardware Overview

Tuesday, 19 May 2026 18:50 (1 hour)

Neutrinoless double beta decay (0□□□) detection would shed light on whether neutrinos are Majorana or Dirac particles, however these measurements necessitate a high energy resolution. Xe-136 double beta decay into Ba-136 is a prime candidate for 0□□□ detection, understanding the scintillation light this decay produces enhances 0□□□ detection capabilities. Silicon photomultipliers (SiPMs) and photomultiplier tubes (PMTs) are two types of photosensors, with SiPMs a candidate for scintillation light detection in various liquid xenon detectors. PMT components are more radioactive than SiPM components, making them less optimal for decay signal observation. SiPMs are composed of many single photon avalanche diodes with higher single photon resolution. Background signals from dark count and noise from optical cross-talk between SiPMs need to be quantified to characterize SiPM behavior, compared to better understood PMTs.

The Light-only Liquid Xenon (LoLX) detector is a vacuum-insulated cryostat where SiPMs and PMTs can be tested and characterized in liquid xenon. The photosensors are currently set up in a cubic inward facing configuration inside the LoLX inner detector, with one PMT and eighty SiPMs, half of which are Hamamatsu Photonics'and half Fondazione Brune Kessler's. LoLX is composed of many interdependent detector and hardware components, presented on this poster, including an LXe purification system, gas handling infrastructure, a cryostat and cryogenic system, data acquisition electronics, and a cubic photosensor array.

Primary authors: ALLEN, Eleanor (McGill University); NITU, Irina (McGill University)

Co-authors: GIRARD, Frédéric (McGill University); WANG, Lei (TRIUMF); LI, Xiang (Simon Fraser University); BRUNNER, Thomas (McGill/TRIUMF); GALLACHER, David; TOTEV, Tsvetelin (McGill University); MALBRUNOT, Chloé (TRIUMF); COULTHARD, Ethan (McGill University); LAVOIE, Simon (McGill University); ROSS, Regan (McGill University); DE ST CROIX, Austin (TRIUMF/Queens); RETIERE, Fabrice (TRIUMF); DARROCH, LUCAS (McGill); LATIF, Mouftahou (McGill University); TÉTRAULT, Marc-André (Université de Sherbrooke); Prof. VIEL, Simon (Carleton University)

Presenter: ALLEN, Eleanor (McGill University)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Neutrinoless double beta decay

Contribution ID: **58** Type: **Invited talk**

Rare-event searches and other applications with xenon detectors

Tuesday, 19 May 2026 09:15 (30 minutes)

Xenon-based detectors have become a central tool in rare-event physics, with liquid xenon playing a leading role in the search for dark matter and shaping a generation of ultra-low-background detector technologies. In this talk, I will survey the current landscape of xenon experiments through the lens of rare-event searches, with emphasis on the dark matter programs and the technical developments they have driven. I will also discuss neutrino physics efforts and highlight other xenon-based experiments that build on the expertise developed for dark matter detection. I will close by connecting these searches to wider applications of xenon-based technologies beyond fundamental physics.

Primary author: BAUDIS, Laura (University of Zurich)

Presenter: BAUDIS, Laura (University of Zurich)

Session Classification: Overview and DM

Track Classification: Overview

Contribution ID: **59** Type: **Poster**

LAr R&D for Argo and DarkSide-LowMass at Queen's University

Tuesday, 19 May 2026 18:50 (1 hour)

To address the challenges of the "neutrino fog" in both high-mass and sub-GeV dark matter searches, a new cryogenic test facility is being commissioned at Queen's University. This facility validates innovative technologies for the future Argo (300-tonne LAr) and DarkSide-LowMass experiments.

A primary focus is the characterization of digital Silicon Photomultipliers, developed by the Université de Sherbrooke, in liquid argon. We will evaluate critical metrics including dark count rate, optical crosstalk, and afterpulsing. In parallel, the facility serves as a development bed for "smart" Data Acquisition systems. In collaboration with Sherbrooke, we are implementing AI-driven algorithms on FPGA hardware for real-time pulse-shape discrimination. This capability is essential for Argo to distinguish electron from nuclear recoils while managing the high data rates of a massive 300-tonne detector.

Furthermore, we will investigate Xenon-doped Argon to measure the impact of dopant concentration on scintillation yield and electroluminescence within a dedicated Time Projection Chamber. This work specifically supports the DarkSide-LowMass experiment's search for GeV–MeV scale WIMPs. By integrating advanced photon-counting, real-time machine learning, and optimized target chemistry, this facility provides a foundation for the next generation of LAr-based rare event searches.

Primary author: HUGUES, Theo (Queen's University)

Presenter: HUGUES, Theo (Queen's University)

Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology

Contribution ID: **60** Type: **Invited talk**

Xenon-doped argon: challenges and prospects for the dark matter search

Thursday, 21 May 2026 15:45 (30 minutes)

Xenon and argon have historically been among the most successful target materials for dark matter searches using direct-detection experiments in underground laboratories. Xenon benefits from its larger atomic size, while the lighter argon nucleus allows for larger recoil energies when struck by a GeV-scale dark matter particle, particularly in experiments that measure charge or nucleation. To extend dark matter searches further into the sub-GeV mass range, xenon-doped argon has emerged as an ideal target material. It has already been tested in ProtoDUNE, is currently under validation in the Scintillating Bubble Chamber experiment, and is a potential candidate for the DarkSide-LowMass program. In this talk, we review the current challenges facing the xenon-doped argon research program and discuss its potential impact on the dark matter and neutrino physics communities, if the technology is successfully scaled to multi-tonne detectors.

Primary author: LAI, Michela (Queen's University)

Presenter: LAI, Michela (Queen's University)

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **61** Type: **Invited talk**

Low-background cryogenic design for large liquid xenon experiments

Wednesday, 20 May 2026 12:00 (30 minutes)

Searched for over half a century with detectors of increasing size and sensitivity, neutrinoless double beta (0νββ) decay offers a means to explore whether neutrinos are massive Majorana fermions and thus a portal between matter and antimatter. nEXO is a five-tonne liquid xenon time projection chamber (LXe TPC) to search for 0νββ decay of xenon-136 with a half-life sensitivity >10^28 years. With respect to its predecessor experiment, EXO-200, nEXO features new scintillation light and ionization charge detectors, and in LXe front-end readout electronics. Despite the uncertain future of nEXO, its cryogenic design includes novel solutions driven by the need by an unprecedentedly low radioactivity design, which can be applied to next-generation liquid xenon detectors of even larger size.
This talk will overview the nEXO design and provide details of the cryogenic and fluid handling and purification systems, highlighting the distinctive features of the LXe TPC technology within the global "tonne scale"program for 0νββ decay. The talk will also present the R&D in support of these novel cryogenic solutions ongoing at UMass Amherst.

Primary author: Dr POCAR, Andrea (University of Massachusetts Amherst)

Presenter: Dr POCAR, Andrea (University of Massachusetts Amherst)

Session Classification: Technology and R&D

Track Classification: Technology

Contribution ID: **62** Type: **Invited talk**

Calibration considerations for neutrinoless double beta decay searches with LXe TPCs

Wednesday, 20 May 2026 11:30 (30 minutes)

The search for neutrinoless double beta decay is of paramount importance to discovering physics beyond the Standard Model. Liquid xenon time projection chambers are a powerful technology for such searches using the isotope 136Xe: the monolithic xenon target is scalable and provides strong self-shielding, enabling extremely low-background searches. Existing detectors have also demonstrated sub-percent energy resolution and mm-scale 3D event reconstruction, enabling powerful signal/background discrimination.

Reaching the sensitivity goals of next-generation experiments will require a careful calibration program spanning instrumental calibration of individual readout channels through validation of full event reconstruction for signal-like and background-like energy deposits. In this talk, I will describe these challenges in the context of current- and next-generation xenon TPCs, using the proposed nEXO experiment as a concrete example. I will summarize the main calibration systems under consideration (including ongoing R&D and prototyping) to characterize the TPC response and its spatial and time dependence. I will also briefly discuss scalability considerations for a future 60–80 tonne instrument such as the proposed XLZD detector.

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