AFLS2025

Report of Contributions

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

Trends in Defect Stability and Electronic Properties of 3d TM-Doped WSe_2

Friday, 21 November 2025 14:30 (15 minutes)

Dilute magnetic semiconductors (DMSs) offer a promising route to novel hybrid electronic devices that can integrate logic processing, communication, and data storage into a single integrated circuit (IC). These DMS-based hybrid devices can use magnetic or electric force, voltage and light to manipulate electron charge and spin, potentially enabling smaller, faster, and more energy-efficient multifunctional chips.

Two-dimensional (2D) transition metal dichalcogenides (TMDCs) are particularly appealing for DMS applications due to their excellent spin relaxation times and long spin diffusion lengths. Unlike graphene, TMDCs have an adjustable bandgap and exhibit stronger spin-orbit coupling—features that are essential for spin-based logic and non-volatile memory technologies. However, since TMDCs do not naturally possess magnetic properties, it is necessary to induce magnetism through doping.

In this study, we explored the electronic structure and energetic stability of single 3d transition metal (TM) dopants in WSe_2 monolayer using density functional theory (DFT) calculations. Our findings reveal that the chemical stability of TM dopants in WSe_2 varies significantly depending on both the doping site within the lattice and the electronic 'd' character of the transition metal. For dopants ranging from Scandium (Sc) to Cobalt (Co), substitutional doping sites are energetically preferred, showing lower formation energies compared to adatom and interstitial doping. In contrast, from Nickel (Ni) to Zinc (Zn), adatom doping becomes more stable, while substitutional doping is energetically unfavorable. It's also worth noting that monolayer WSe_2 inherently possesses a direct bandgap. We find that doping does not always preserve the direct bandgap. Additionally, incorporating 3d transition metal atoms into WSe2 lattice introduces defect energy levels within the bandgap, with the band gap of WSe2 reduced to between 0.05 eV to 1.0 eV across the 3d series. Furthermore, we find that increasing the dopant concentration lowers the formation energy per atom in WSe2, favouring clustering. These results present important implications to the understanding of properties of transition metal dopants in WSe2, as well as in other dilute magnetic semiconductors where the effect of aggregation of dopants has generally been neglected.

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Session Classification: Friday Afternoon I

Track Classification: AfPS

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

Phosphorylation of the BAR domain protein PACSIN2 regulates caveolae morphogenesis and endocytosis

Friday, 21 November 2025 14:00 (15 minutes)

Bin/Amphiphysin/Rvs (BAR) domain proteins are lipid-binding proteins that form dimers and sense and generate membrane curvatures. One of these BAR domain proteins, protein kinase C (PKC) and casein kinase substrate in neurons protein 2 (PACSIN2), regulates the morphogenesis and endocytosis of caveolae. Here, we found that PACSIN2 is phosphorylated at serine 313 by PKC. We performed analytical ultracentrifugation experiments on both the wild-type and phosphomimetic mutant S313E of PACSIN2, revealing that they both form dimers. We then performed SAXS experiments and found that the PACSIN2 S313E mutant shows no significant conformational changes in protein structure. These results suggest that phosphorylation of PACSIN2 has no significant effect on protein structures, rather decreasing its membrane-binding affinity for caveolae, presumably through electrostatic repulsion against negatively charged membranes, thus regulating the morphogenesis and endocytosis of caveolae.

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Session Classification: Friday Afternoon I

Track Classification: AfLS

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

Application Of Surface-Enhanced Raman Spectroscopy And Chemometrics In Total Aflatoxin Detection And Quantification In An Alcoholic Beverage

Thursday, 20 November 2025 10:45 (15 minutes)

ABSTRACT
Aflatoxins (AFs) are produced by certain fungi found on agricultural crops like maize, peanuts, cottonseed, and tree nuts. The main aflatoxin producers are Aspergillus parasiticus and A. flavus. The most widely known are Aflatoxin B1 (AFB1), Aflatoxin B2 (AFB2), Aflatoxin G1 (AFG1), and Aflatoxin G2 (AFG2). AFB1 is the most toxic and highly carcinogenic of all the AFs, and long-term exposure to it results in liver cancer. Thus, maximum exposure limits have been set by regulatory boards across the world. European Union (EU) and Chinese standards set the permissible AFs in human food to range between 0.004- 0.015 µg/ml and 0.005- 0.020 µg/ml respectively. The Kenya Bureau of Standard (KEBS) regulatory board set limits should not be more than 0.010 µg/ml in maize and its products. Maize and barley are susceptible to AFs contamination and are widely used as a raw ingredient in the production of commercial and traditional beers hence detection of AFs should be done on beer. Enzyme-linked Immunosorbent Assay (ELISA), High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Liquid Chromatography (LC), LC coupled mass spectrometry, and Immunoaffinity Clean-Up Columns are some of the methods used to detect AFs. These methods have some limitations as they are expensive, require specialized personnel, and involve use of chemical reagents among others. In this work, Surface Enhanced Raman Spectroscopy (SERS) is explored as a potential alternative in detecting these dangerous toxins in beer samples. This method (i.e. SERS) which is one of the most sensitive (to one molecule detection) vibrational spectroscopic technique, uses vibrational signatures of the target molecules as chemical markers. It utilizes metallic nanostructures as substrates. Here, silver nanoparticles were first synthesized by laser ablation in liquid method and characterized optically and morphologically. The Scanning Electron Microscopy (SEM) results showed that the synthesized AgNPs were spherical in shape and approximately 34 nm each in diameter. The absorbance of the localized surface plasmon (LSP) resonance band of these nanoparticles were peaked at around 404 nm and the fingerprint Raman peak centered at 214 nm. These AgNPs colloids were then mixed with clean and AF-spiked beer. The AF-spiked beer were prepared at concentrations ranging from 0.00001 µg/ml to 0.003 µg/ml (low concentrations), 0.004 µg/ml to 0.01µg/ml (permissible level range) and 0.02 µg/ml to 0.2 µg/ml (high concentrations). A drop (˜30 µl) of each of the samples were then applied, separately, onto an aluminum foil wrapped microscope glass slide and excited with a 785 nm laser when not dried and when dried and Raman spectra recorded for each sample. SERS spectral data sets were analyzed using ANOVA and PCA methods to extract the aflatoxins marker bands in beer. The bands that exhibited significant variation in intensity with aflatoxins concentration were centered at 838cm-1(ring deformation), 1016cm-1(β (C-O) and ν(C-O)), 1084cm-1(ν (CC-C) and ring deformation), 1196cm-1(β(C-H) ring β(C-H)(-CH3)), and 1386cm-1(δ(CH3)). These bands could be used as aflatoxin's Raman marker bands in beer. The bands were used as inputs to ANN models, trained and used in AFs concentration predictions. The model exhibited an accuracy of between 89-90%. The model predicted unknown concentration of Aflatoxins in beer with least concentration recorded being 0.001ug/ml and highest concentration being 0.110ug/ml. This work has demonstrated the potential use of SERS as an alternative technique to detect aflatoxins in alcoholic

beverages which makes it an important tool in food industry.

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Session Classification: Thursday Morning II

Track Classification: AfPS

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

Comparative analysis using SCAPS 1-D software on the stability and toxicity of FAPbI3 and FASnI3 perovskites, aiming for environmental protection.

Tuesday, 18 November 2025 09:00 (15 minutes)

Hybrid organic-inorganic perovskites such as $FAPbI_3$ (lead iodide and formamidinium) and $FASnI_3$ (tin iodide and formamidinium) are recognized as promising materials for the next generation of high-efficiency solar cells. $FAPbI_3$ is particularly valued for its stability and excellent optoelectronic properties. However, the toxicity of lead and the resulting environmental concerns drive the search for alternatives such as $FASnI_3$, where tin, a less toxic and more abundant element, replaces lead, which is the goal of this study. The lead-free structure simulated using SCAPS-1D software is as follows: FTO/TiO_2/$FASnI_3$/Spiro-OMeTAD/Ag. The research presented here shows that optimizing several parameters can achieve a power conversion efficiency (PCE) of 22.49%. In order to better compare this solar cell to $FAPbI_3$, various parameters affecting the device's performance, such as the thickness and doping of the ETL and HTL layers, as well as the total defect density of the absorbing layer, are studied and discussed. The best results obtained after optimizing the aforementioned parameters are: Jsc of 30.65 mA/cm², Voc of 0.8469 V, FF of 86.63%, and PCE of 22.49%. In this study, we used the SCAPS-1D simulator to model and evaluate the performance of photovoltaic devices based on these two perovskites. We chose TiO_2 as the electron transport layer (ETL) due to its wide band gap (˜3.2 eV), which effectively blocks holes and prevents their recombination with electrons, thus promoting better charge separation. Furthermore, the favorable alignment of the energy levels of TiO_2 with that of the perovskites facilitates the transfer of electrons to the silver (Ag) electrode [3]. For the hole transport layer (HTL), we chose Spiro-OMeTAD, whose valence band level is well aligned with that of the perovskites, thus facilitating hole extraction to the upper silver electrode. Using the SCAPS-1D simulator, we then compared the electrical and optical properties of the devices, focusing on key parameters such as short-circuit current density (Jsc), open-circuit voltage (Voc), fill factor (FF), and power conversion efficiency (PCE). Additionally, the structure studied in this paper could be a good candidate for future research on lead-free perovskite solar cells.

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Session Classification: Tuesday Morning I

Track Classification: AfPS

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

Longitudinal Beam Diagnostics Using Streak Camera Imaging

Friday, 21 November 2025 14:15 (15 minutes)

The development of accelerator-based light sources relies heavily on accurate beam diagnostics to ensure high beam quality for scientific users. This work presents longitudinal beam diagnostics performed with streak camera imaging at the Budker Institute of Nuclear Physics, with application to different facilities at the Institute. Using picosecond resolution, streak cameras enable direct measurement of bunch length, timing jitter, and beam profile deformation. At NovoFEL, the dependence of bunch length on RF phase was studied; at VEPP-4M, intrinsic energy spread was measured; and for the Microtron, bunch spacing and macropulse structure in the optical range were analyzed. These results demonstrate the critical role of time-resolved diagnostics in maintaining beam stability and optimizing accelerator performance. Such methods are directly relevant for the design and operation of future African light sources, supporting reliable and efficient delivery of high-quality beams for regional and international research communities.

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Session Classification: Friday Afternoon I

Track Classification: AfLS

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

Theoretical and experimental study of optoelectronic oscillators (OEO) for telecommuni-cations, metrology, and artificial intelligence

Tuesday, 18 November 2025 09:15 (15 minutes)

The optoelectronic oscillators (OEO) consist of closed-loop oscillators characterized by an optical path with local nonlinearity and a linear frequency-filtered electrical path. This para-digmatic system is an ideal benchmark for the investigation of delay-based infinite-dimensional systems, which provide a higher complexity than low-dimensional nonlinear systems. The OEOs find their numerous main technological applications in areas such as ultra-stable microwave generation, optical communications, information processing, artificial intelligence, sensing, random numbers generation, and more, with performances surpassing other systems.

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Session Classification: Tuesday Morning I

Track Classification: AfPS

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

Synthesis and Characterization of Aluminophosphate. Application to photodegradation of Methyl Violet Dye

Friday, 21 November 2025 14:45 (15 minutes)

Synthesis and Characterization of Aluminophosphate. Application to photodegradation of Methyl Violet Dye

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Aluminophosphates (AlPO) constitute an important family of microporous materials. They are composed of Al and P atoms arranged in a neutral structure. These materials are known for their applications in various fields.
Among, these materials KAlPO4F, the as -prepared product obtained by hydrothermal route at 180 ℃. The white solid was characterized by different methods such as powder X-ray diffraction, thermal analysis, SEM image and UV–Vis diffuse reflectance spectroscopy.
The as- prepared compound crystallizes in an orthorhombic system (Space Group: Pnna) with the refined lattice constants: a=12.612(5) Å, b=10.172(3) Å, c=6.205(0) Å. The structure is made up of AlF2O4 octahedra and PO4 tetrahedra where the K+ ions are disordered.
Thermal analysis shows that our phosphate is thermally stable up to 300 ℃. SEM images shows crystals with hexagonal sections. The direct optical transition of 4.93 eV, determined from the diffuse reflectance, is assigned to the charge transfer F−: 2p⟶ K+: 4s.
The photocatalytic performance was successfully tested through the degradation under solar light of methyl violet (MV), a hazardous and persistent dye. A total discoloration was obtained after 5 h illumination and a reaction mechanism is proposed.

Keywords: aluminophosphate, photocatalysis,environment, wastewater, light, chemistry

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Session Classification: Friday Afternoon I

Track Classification: AfLS

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

Partial Melting of Hydrous Carbonated Fertile Peridotite at 3 GPa: Influence of Water and CO2 in the Formation of Picrites and Komatiites

Tuesday, 18 November 2025 09:45 (15 minutes)

Komatiites and picrites are ultramafic volcanic rocks characterized by high magnesium oxide content (15 – 32 wt.%) that mostly erupted throughout the Archean and Proterozoic eras globally. Their production is a contentious topic, with models proposing extensive volatile-free partial melting of mantle peridotite and the melting of hydrous mantle as potential mechanisms. Additionally, numerous investigations have identified CO2 in the melt inclusions of these rocks. These volatiles substantially lower the melting point of peridotite in the upper mantle by several hundred degrees. Nonetheless, the limitations on the influence of H2O–CO2 fluids on the formation of picrites and komatiites are restricted. This work presents two sets of piston-cylinder experiments conducted at controlled and static temperatures on a fertile peridotite composition (MixKLB-1; XMg = 0.89) with 1 wt.% CO2 and XH2O values of 0.86 and 0.92. Given that these volatiles exhibit significant solubility in silicate melts at pressures above 2 GPa, all experiments were performed at 3 GPa and within a temperature range of 1200 to 1575℃ to simulate upper mantle conditions from the Archean to Proterozoic eras. In the controlled heating experiments (1350-1575℃), the temperature was initially elevated to 75–200 ℃ above the target run temperature and maintained for 10 minutes to 3 hours to facilitate the development of big crystals (>35 μm). Subsequently, the temperature was reduced to the end run temperature at consistent ramp rates ranging from 19.8 to 51℃/h and maintained at the target temperature for a duration of 6 to 16 hours. The static experiments were conducted at constant temperatures ranging from 1200 to 1300℃ for durations of 30 to 120 hours. A broad spectrum of melt proportions (<5 – 61 wt.%) was detected in equilibrium with olivine + orthopyroxene ± clinopyroxene throughout every experiment. As the degree of melting increases, the composition of the partial melt, excluding volatiles, transitions from picritic to komatiitic, characterized by 14.5–34 wt.% MgO, 38–51 wt.% SiO2, and an Al/Ti ratio of 5.5–12.9. The analogous major element concentrations of hydrous carbonated partial melts (4.1 - 11.2 wt.% Al2O3, 7.2 – 14.8 wt.% FeO, and CaO/Al2O3 ratios of 1-3.5) with natural picrites and komatiites indicates the presence of both CO2 and H2O in the source of these ultramafic rocks.

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Session Classification: Tuesday Morning I

Track Classification: AfPS

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

Shedding ESRF-EBS light on artworks to get insight into their creation and to better preserve them

Wednesday, 19 November 2025 15:00 (30 minutes)

In 2019, the European Synchrotron's core machine was completely dismantled to install a revolutionary machine producing a much brighter X-ray source. This upgrade has not only dramatically improved the properties of the X-ray beam, but also triggered several projects to improve the user experience, upstream and downstream data collection. As far as the cultural heritage community is concerned, the results are numerous [1].
For many beamlines, the increase in brightness translates into higher flux, smaller beams and faster acquisitions. This has motivated the implementation of a facilitated community access for structural analyses of historic materials (known as "BAG" access [2, 3]). Access is granted every six months to two X-ray powder diffraction (XRPD) beamlines (ID13 for μXRPD and ID22 for high angular resolution XRPD) and beamtime is shared by a network of more than 120 international collaborators. Such analyses have led to major discoveries such as the identification of a very unusual lead carbonate (plumbonacrite) in Mona Lisa's and in the Last Supper's ground layers, giving insights into Leonardo da Vinci's painting techniques [4].
The throughput of these beamlines (>200 samples analysed per experiment) is so high that this has motivated the creation of a dedicated database to make the data collected more FAIR and facilitate its re-use by anyone (project "SHARE", funded by the OSCARS European Call) [5].
In parallel, in the field of X-ray micro-spectroscopy, the ID21 beamline has just been refurbished and its new nanoscope provides unprecedented performance for 2D nano-XRF mapping and nano-XANES in the 2.1-10 keV energy range. These two techniques can now be efficiently combined for hyper-spectral XRF mapping, to identify and locate species at the nano-scale, over millimetric regions. These assets are very important to tackle subtle chemical modifications related to artefact manufacturing (e.g. ceramics firing) or alteration (e.g. pigment degradations). Efforts are also being made to provide users with easy-to-use graphical interfaces for data acquisition and to automate data processing and analysis.
Regarding X-ray computed tomography, a new flagship beamline, BM18, has been built and optimised for multiresolution phase-contrast imaging of large objects. Thanks to a wide beam of up to 30 cm horizontally and an energy of up to about 300 keV in filtered white beam, several large fossils and a dozen of music instruments have recently been successfully imaged [6].
In summary, the last five years have been instrumental in revolutionizing the user experience at the ESRF and, as recent examples will show, the benefits to the cultural heritage community are enormous.

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Session Classification: Wednesday Afternoon I

Track Classification: AfLS

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

Hierarchical core–shell NiS/Co_3S_4@ Ni Nanowire composite for high performance supercapacitor electrode

Friday, 21 November 2025 15:00 (15 minutes)

In this study, hierarchical nickel nanowires (h-Ni NWs) were employed as a conductive backbone to enhance the electrochemical behavior of Ni Co sulfides for efficient energy storage. The composite was fabricated through a simple hydrothermal route, yielding a core–shell NiS/Co_3S_4@h-Ni NW structure. The physicochemical properties of the obtained materials were investigated using X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), and scanning electron microscopy (SEM). Electrochemical analyses were performed in a 4 M LiOH electrolyte within a three-electrode system. The optimized NiS/Co_3S_4@h-Ni NW electrode delivered a remarkable specific capacity of 1893 $C \cdot g^{-1}$ at 1 $A \cdot g^{-1}$ and retained 98.63% of its initial value after 10,000 charge discharge cycles at 20 $A \cdot g^{-1}$. These outstanding results are attributed to the synergistic effects between the nickel nanowire core and the (Ni/Co) sulfide shell, which facilitate charge transfer and structural stability.

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Session Classification: Friday Afternoon I

Track Classification: AfLS

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

Partial Melting Experiments in Carbonated Secondary Pyroxenite at 3 GPa and Origin of Primary Arc Magmas

Tuesday, 18 November 2025 10:00 (15 minutes)

Introduction
Subduction of oceanic lithosphere fluxes the mantle wedge with carbonate and hydrous fluids, thus commencing the crustal recycling process, which results in mantle heterogeneity. The melting of the subducted slab and the mantle wedge generates arc magmas. Arc magmas are enriched in incompatible trace elements relative to MORB, reflecting contributions from subducted slab-derived fluids and melts. Geochemistry of arc magmas suggests influence of olivine-poor mafic lithologies, such as pyroxenites in the source mantle wedge, which are produced from the reaction between the subducting slab and the ambient mantle peridotite. Here, we report new partial melting experiments of carbonated secondary pyroxenite, performed at 3 GPa and 900-1425 ℃ to investigate the role of pyroxenite in the generation of arc melts. A silica-deficient secondary pyroxenite with Mg# of 0.85 and Ca# of 0.26 was used as a starting material, fluxed with 2.5 wt.% CO2. All experiments were performed in a 0.5-inch Talc-Pyrex assembly in a piston cylinder apparatus at IIT Kharagpur. Starting material was loaded in a graphite-lined Pt capsule and welded shut to prevent loss of volatiles. This procedure minimized Fe-loss and kept the oxygen fugacity in the vicinity of the CCO buffer.

Results
Near-solidus runs consist of clinopyroxene (Cpx), orthopyroxene (Opx), garnet (Grt), and quartz (Qz), along with carbonatitic melt. The low-degree carbonatitic melt changes to carbonated silicate melt with increasing degree of melting (>15%) after exhaustion of Qz. Modal abundance of Opx sharply increases and starts to segregate from Cpx with the dissolution of Grt (melt fraction >25%). Cpx exhausts at melt fraction > 50%, leaving out Opx as the liquidus phase. The partial melt compositions (volatile-free basis) formed near and after the garnet exhaustion are basaltic-andesite to basalt (SiO2 56.8 - 51.7 wt.%, CaO 10.4 - 12.6 wt.%). The volatile-free major element compositions of carbonated-silicate melts after Grt exhaustion show Al2O3 (16.2–13.6 wt.%), MgO (8.5–15.4 wt.%), and CaO/Al2O3 ratios of 0.64–0.90. These compositions suggest that CO_2-fluxed melting of slab-derived secondary pyroxenite can produce melts similar to primary melts of tholeiitic basalts from Izu-Bonin and Japan arcs.

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Session Classification: Tuesday Morning I

Track Classification: AfPS

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

Effects of Cooling Rate and Wall Inclination on the Solidification of Pure Tin in a Quasi-2D Trapezoidal Cavity

Tuesday, 18 November 2025 10:15 (15 minutes)

Controlling how metals solidify is a key challenge in thermal engineering and materials processing, since it directly shapes the microstructure, mechanical strength, and overall quality of the final product. In this study, we explore the impact of natural convection on the solidification of pure tin metal inside a quasi-2D trapezoidal cavity. The horizontal walls of the trapezoidal cavity are insulated and two side walls kept at constant but different temperatures. Our objective is to observe the wall inclination and cooling rate effects during the solidification process. To capture the physics of the process, we use the enthalpy–porosity model, which accounts for the release of latent heat and treats the mushy zone as a porous medium described by the liquid fraction. The equations governing heat transfer and fluid flow are solved using the finite element method. The results reveal the evolution of the flow field, temperature distribution, and solid–liquid interface over time. We find that both the inclination angle and the cooling rate play important roles in controlling how quickly the metal solidifies. The numerical results agree well with experimental data, confirming the reliability of our approach. Moreover, the proposed quasi-2D (2D½) model successfully reproduces the behaviour of a full three-dimensional cavity, capturing not only the thermal and flow patterns but also the shape and position of the solidification front.

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Session Classification: Tuesday Morning I

Track Classification: AfPS

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

CALCULATIONS OF TRIPLE DIFFERENTIAL CROSS SECTIONS FOR ELECTRON IMPACT IONIZATION OF Mg IN COPLANAR SYMMETRIC GEOMETRY FROM LOW TO INTERMEDIATE ENERGIES

Thursday, 20 November 2025 11:30 (15 minutes)

The study of electron impact ionization of atomic targets is very important because of the wide range of kinematical situations available in the three body final state. Extensive research has been done on this area using different method such DWBA, CCC and ECS but there is a generally lack of agreement between the theoretical and experimental results at low electron impact energies. In this report we present results for TDCS of Mg in coplanar symmetric geometry using the DWBA with the static potential and polarization potential in the angle range between 0^0 and 180^0. The energy range of the incident electron is between 13.65eV to 67.65eV. The present results were compared with existing experimental and theoretical results in the literature. The results obtained are in good agreement with experimental at the lowest energy (13.65eV) and slightly differ in terms of position and size of peaks and dip on the other energies. The present results differ with both the experimental and theoretical results at large angles We also note that agreement between the results and the experimental results increase with increase in energy of the incident electron. The present results show that there is a need for a proper treatment of higher order effects in the calculation of polarization potential

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Session Classification: Thursday Morning II

Track Classification: AfPS

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

DFT and AIMD Investigation of Hydrogen Storage in Alkali Metal Hydrides XH (X=Li, Na, and K)

Tuesday, 18 November 2025 10:45 (15 minutes)

This study employs first-principles density functional theory (DFT) calculations to examine the hydrogen storage capacity of alkali metal hydrides (XH, where X = Li, Na, and K). We systematically examine the structural, mechanical, dynamical, electronic, and thermodynamic properties of these hydrides, along with key hydrogen storage metrics, such as gravimetric and volumetric capacities, and desorption temperatures. The results demonstrate that all of the investigated hydrides are thermodynamically stable. LiH demonstrates the highest performance among them, with gravimetric and volumetric capacities of 12.68 wt% and 104.13 g.H 2 /L, respectively. In contrast, NaH and KH have lower gravimetric capacities of 4.20 wt% and 2.51 wt%, respectively, and lower volumetric capacities of 59.32 g.H 2 /L and 36.16 g.H 2 /L, respectively. The estimated desorption temperatures are 612.40 K for LiH, 315.81 K for NaH, and 396.58 K for KH. Ab initio molecular dynamics (AIMD) simulations confirm the thermal stability of these hydrides at room temperature. Overall, alkali metal hydrides show promising potential as hydrogen storage materials.

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Session Classification: Tuesday Morning II

Track Classification: AfPS

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

Theoretical Study of the Electronic Structure and Magnetic Properties of Pt-Doped LiFeAs via first principle DFT

Tuesday, 18 November 2025 11:00 (15 minutes)

A comprehensive first-principles study of the electronic structure and magnetic properties of Pt-doped LiFeAs superconductors has been carried out using density functional theory (DFT) within the Quantum ESPRESSO package, utilizing the PWscf code and projector augmented-wave (PAW) pseudopotentials based on the Perdew–Burke–Ernzerhof (PBE) exchange-correlation functional. Platinum doping levels of 12.5%, 25%, 50%, and 100% were systematically investigated to assess their influence on the electronic and magnetic behavior of LiFeAs in non-magnetic (NM), ferromagnetic (FM), and antiferromagnetic (AFM) configurations. The computed band structures, total and partial densities of states (DOS and PDOS), and site-projected magnetic moments reveal that Pt doping causes notable redistribution of electronic states near the Fermi level and progressively suppresses magnetic ordering. In the pristine compound, Fe atoms exhibit magnetic moments of approximately 1.76μB in the FM state and 1.58μB in the AFM state, confirming significant spin polarization and the energetic favorability of AFM ordering. Upon Pt substitution, the Fe magnetic moments are reduced, and Pt atoms contribute negligibly to the total magnetism (<0.05μB), consistent with their closed d-shell character. For NM configurations, the density of states at the Fermi level, N(EF), decreases from 5.08 to 4.12 states/eV as the Pt doping level increases from 12.5% to 25%. In FM and AFM configurations, N (EF) values further drop to 2.10 and 1.74 states/eV, respectively. This reduction in N(EF) with increasing Pt content implies a weakening of the superconducting pairing channels, suggesting a suppression of superconductivity. Although the observed trends in DOS provide indirect but valuable insights into the interplay between electronic structure, magnetism, and
superconductivity. These findings offer a theoretical foundation for tuning the magnetic and electronic properties of Fe-based superconductors via Pt doping and pave the way for future investigations incorporating explicit superconductivity-related calculations.

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Session Classification: Tuesday Morning II

Track Classification: AfPS

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

Synergistic passivation of ZnO electron transport layer using 2D self-assembled monolayer and ZnO nanoparticles to improve stability of non-fullerene organic solar cells

Thursday, 20 November 2025 11:00 (15 minutes)

Organic solar cells (OSCs) have emerged as a promising next generation source of green energy due to some desirable properties such as low-cost fabrication, mechanical flexibility, and tunable opto-electronic properties [1]. Despite achieving power conversion efficiencies around 20%, the limited long-term stability of the multi-layer OSCs remains a major challenge for the full commercialization [2]. Herein, we have investigated the role of Zinc Oxide (ZnO) electron transporting layer (ETLs) and their modification strategies to improve device performance and stability. ZnO films were prepared using sol-gel method and further modified with 2D self-assembled monolayers (SAM) and ZnO nanoparticle (ZnONP) as a bi-layer to suppress the ZnO ETL interfacial defect states and improve interface contacts at the ETL and photo-active layer. Devices were characterized using current-voltage measurements, Raman spectroscopy, intensity modulated photocurrent and photo-voltage (IMPS and IMVS), and impedance spectroscopy. Stability tests were measured after one-week of dark storage without encapsulation. Optical and electrical characterization techniques revealed that the synergistic effect of ZnO nanoparticles and SAM surface passivation effectively reduced carrier recombination, resulting in a 14% increase in efficiency compared to the pristine ZnO ETL-based OSC device. More importantly, devices with modified ZnO ETLs retained over 80% of their initial efficiency whereas the pristine ZnO ETLs based device were degraded significantly. These results highlight the critical role of interface engineering in stabilizing OSCs and provide a practical pathway toward their large-scale application.
Keywords: Organic solar cells, electron transporting layer, Sol-gel ZnO, Surface passivation, impedance spectroscopy, IMPS/IMVS
References
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2. Ding, P., Yang, D., Yang, S., & Ge, Z. (2024). Stability of organic solar cells: toward commercial applications. Chemical Society Reviews, 53(5), 2350-2387.

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Session Classification: Thursday Morning II

Track Classification: AfPS

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

Advancement of the Optical Fiber Transmission System

Tuesday, 18 November 2025 09:30 (15 minutes)

The quality of the beam from a single-mode laser is higher compared to that of other multi-mode lasers due to its operating process, which is based on a single transverse resonating system. Its beam quality factor, i.e., M2, is less than 1.03, so the relation between the ridge width of this laser and the size of the core of the fiber is important for the successful signal transmission.
Due to the narrow active area and larger power densities at the facet of this laser, the dispersion compensation will become a more important factor in this research. Finally, the optical fiber communication based on the non-return to zero (NRZ) technique with a single-mode laser diode is investigated in this simulation process by OptiSystem software 19.0. It would be observed that the merits and demerits of the optical transmission system are driven by the peak current of a single-mode laser for a certain fiber length.

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Presenter: Dr JHA, Ved (MLSM College, Darbhanga)

Session Classification: Tuesday Morning I

Track Classification: AfPS

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

Experimental Investigation of Indoor Air Quality of a Public Bus Transport under Driving Conditions in a Tropical Climate

Wednesday, 19 November 2025 09:00 (15 minutes)

African cities are growing fast, owing to the ongoing development and accelerated demography. This urbanization brings forth challenges for transport and mobility, where millions of passengers should be carried from their homes to various places: schools, markets, hospitals, etc. Several means are available: motorbikes, taxicabs, buses, modified pickups, trucks and vans, trams and undergrounds. Road transport appears as the dominant transportation mode, and massive public transport by public bus transport linking city canters and sub-urban areas are being preferred by passengers on long distances. In recent years, urban air pollution has become an emergent crisis aggravated by unregulated traffic, unpaved and degraded roads, low quality fuels and massive vehicles imports. Even though, the health impacts are now, there is a paucity of studies on air quality in bus cabins moving in sub-Sahara Africa. In this study, the quality of air inside a bus cabin in real conditions is investigated. An AFTU bus in the city of Thiès, in Senegal moving on line 2, from the North to the South is investigated. Two main instruments, a GPS app and an optical particle counter (Particle Plus 8301-AQM2) were used. Bus speed (m.s-1) and position (longitude, latitude), Carbon dioxide concentration (ppm), temperature (℃) and relative humidity (RH) were monitored at various periods of the days for three days. The average speed was low, 1.80-2.80 m/s and showed very low correlation with environmental parameters. Mean carbon dioxide concentrations, were in the range 560-810 ppm and relative humidity, 48-73%. The mean temperature was high: 29-36 ℃. Temperature correlates with carbon dioxide concentration during the days but poor correlation seems to appear in the evening. The optimal conditions were not met, and it is found that in absence of an AC, keeping doors and windows open help in eliminating excess CO2 but ends in high temperature.

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Presenter: TCHANCHE, Bertrand (Université Alioune Diop de Bambey)

Session Classification: Wednesday Morning I

Track Classification: AfPS

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

Evaluation of Indoor and Outdoor Environmental Radiation in the Federal College of Education (Technical), Gombe, North-Eastern. Nigeria.

Wednesday, 19 November 2025 09:15 (15 minutes)

Background ionizing radiation is a significant source of environmental exposure and possible health hazards for the general public, especially in cities where schools are located next to landfills. The levels and radiological effects of background ionizing radiation at Federal College of Education (Technical), Gombe, in Gombe Metropolis, Nigeria, are examined in this study. Using a portable Radiation Alert Inspector meter, radiation dose rates were measured both indoors and outdoors in a few chosen buildings. Using accepted international conversion factors, the acquired exposure rates were transformed into excess lifetime cancer risk (ELCR), absorbed dose rate (ADR), and annual effective dose equivalent (AEDE).

The findings indicated that exposure rates ranged from 0.015 to 0.0467 μSv/h (mean: 0.0293 ± 0.0098 μSv/h) indoors and from 0.015 to 0.040 μSv/h (mean: 0.0330 ± 0.0077 μSv/h) outdoors. The associated mean AEDE values were 0.049 mSv/year (outdoor) and 0.227 mSv/year (indoor), both of which are below the International Commission on Radiological Protection's (ICRP, 2007) suggested 1.0 mSv/year public exposure limit. The ELCR values, which varied from 4.19×10^{-4} to 1.30×10ˆ(-3), showed negligible long-term health consequences in contrast to the UNSCEAR (2020) reported worldwide average risk factor (2.9×10^{-4}).

According to the study's findings, background ionizing radiation levels in the vicinity of FCE(T) Gombe and adjacent waste zones continue to be below reasonable safety bounds. However, to guarantee continued environmental safety and public health protection, constant monitoring is advised.

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Presenters: Mr ABDULKAREEM, Muhammad Nuruddeen (Federal University of Kashere); Mr USMAN, Muhammad Mudassir (Federal University of Kashere); Mr SABO MUHAMMAD, Isa (Federal University of Kashere)

Session Classification: Wednesday Morning I

Track Classification: AfPS

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

Rare Earth based scintillation materials

Tuesday, 18 November 2025 11:15 (15 minutes)

Scintillation efficiency defines the future of radiation detection. This study examines Rb_2LuI_5 and Rb_2PrI_5 using DFT, TDDFT, and Geant4 simulations. Both compounds show stable orthorhombic structures, moderate band gaps, and strong visible transparency. Short radiative lifetimes and high light yields surpass standard scintillators, while Geant4 results confirm excellent gamma-ray absorption, marking them as strong candidates for next-generation detectors.

Primary authors: Mr ZAGHRANE, Abderrahmane; Prof. ABBASSI, A.; Prof. TAJ, S; Prof. MANAUT, B.

Presenter: Mr ZAGHRANE, Abderrahmane

Session Classification: Tuesday Morning II

Track Classification: AfPS

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

Exploring the Composition of Ghana's Manganese through Geochemical, Mineralogical, and Particle Size Analysis

Friday, 21 November 2025 09:30 (30 minutes)

1.Introduction

This study presents a detailed chemical and mineralogical analysis of manganese ore from the Nsuta deposit in Ghana. We employed an integrated multi-technique approach to address gaps in the comprehensive characterisation of this strategic resource, particularly concerning valuable elements of economic value. Subsurface samples were prepared and separated into distinct particle size fractions. Elemental concentrations were determined using X-ray Fluorescence (XRF) and Neutron Activation Analysis (NAA), while mineral phases and textures were identified via X-ray Diffraction (XRD) and petrographic microscopy. This combined methodology provides a more robust assessment of the ores' quality and economic potential than single-technique studies [1, 2].

2.Results

The Nsuta manganese ore was found to be rich in the medium-sized particle range and was composed mainly of rhodochrosite (72.2 wt%), with minor sphalerite and graphite. A key finding was the clear relationship between particle size and chemical content. Finer fractions (<150 μm) showed a 20–35% enrichment in valuable metals compared to the weighted average of the bulk ore. Statistical comparison confirmed that NAA provided consistently lower detection limits for trace and rare earth elements, underlining its superior sensitivity for comprehensive geochemical characterisation [3].

3.Conclusion

The integrated use of XRF, NAA, XRD, and petrography proved highly effective for the thorough evaluation of Ghana's manganese ores. The findings confirm substantial economic potential, not only for primary metal extraction but also for the future valorisation of Critical Raw Materials concentrated in specific particle size fractions. The marked enrichment of valuable metals in finer particles highlights a clear opportunity to optimise metal recovery by targeting these fractions during processing. This study provides a critical dataset and a reliable analytical framework to guide future resource management, process optimisation, and policy development for Ghana's mining sector [4].

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Session Classification: Friday Morning I

Track Classification: AfLS

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

Investigating the Accumulation of Heavy Metal Pollutant in Water Leaf and their Effects on Soil Microbial Population in Calabar, Nigeria.

Wednesday, 19 November 2025 09:30 (15 minutes)

Heavy metals are bioaccumulated and bio transferred both by natural and anthropogenic sources. The contamination by heavy metals in soil and waterleaf is one of the major issues to be faced throughout the world and requires attention because heavy metals above their normal ranges are extremely threatening to both plant and animal life. It was therefore of interest to conduct a study to estimate levels of heavy metals in both soil and waterleaf. This study assessed the levels of heavy metals present in soil and waterleaf (Talinum triangulare). Waterleaf and soil samples were collected as randomly composite samples from five (5) different study locations. Three (3) each from Calabar South Local Government Area and two (2) from Calabar Municipality. The samples were analyzed/examined for heavy metal concentration, using photometer 7500 (palintest). Results showed that concentration of Lead (Pb), Cadmium (Cd), Copper (Cu) in water leaf were recorded above the permissible limits set by WHO while Arsenic (As) were recorded below the permissible limits. Concentrations of heavy metals in soil were also compared with WHO standards for heavy metals and in the soil samples concentration of heavy metals were recorded above the permissible limits set by WHO. It may be concluded that there is a high tendency of exposure to heavy metals by those who consume waterleaf in the studied locations since the levels in waterleaf from all sources studied generally exceeded the WHO/FOA limits
Key words: Accumulation, Heavy, Metals, Microbial, Soil, Waterleaf.

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Session Classification: Wednesday Morning I

Track Classification: AfPS

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

Impact of Magnetic Properties on Selective Emitters metamaterial for Low Band-Gap Thermophotovoltaic Applications.

Wednesday, 19 November 2025 10:45 (15 minutes)

Tesfaye Feyisa1, 2*, Fekadu Tolessa1, Abebe Belay1, Kusse Kudishe2, Umer sherefedin3, Melak Birara1, Gemechis Mathewos1, Dereje Gelanu1, Menza Zeyitib1.
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Abstract
Nonrenewable fossil fuels are the primary source of energy used globally. In this study, we have designed a broadband, wide-angle, and polarization-independent grating metamaterial (MDM) emitter for thermophotovoltaics (TPV), which falls under the category of renewable energy. The electronic and optical properties of materials, model metamaterial structures, and simulate their optical properties using DFT and FEM approaches were analyzed. The designed emitter utilizes a cutoff wavelength of 2.7 μm to enhance the conversion efficiency of InGaAsSb cells. We also examined the impact of magnetic properties on the selective emitter. We found that the material's magnetic properties affect and become a cause for broadband emittance capacity. The simulations demonstrated a mean emittance of 94% within the wavelength range of 0.3–2.7 μm were obtained. Compared to other emitters, the proposed design exhibits superior spectral efficiency for the InGaAsSb cell. Additionally, at 800 K, the grating emitter achieved 76% spectral efficiency for an InGaAsSb bandgap of 0.46 eV. Surface plasmon polaritons, magnetic polaritons, and intrinsic InMnAs exhibit strong absorption at the cutoff wavelength. The key advantages of this work include high average emittance, polarization insensitivity, simple fabrication, cost efficiency and excellent spectral performance.
Keywords: Selective Emitter, Energy, Thermo photovoltaic, Magnetic-Metamaterial

Primary authors: HURRISA, Tesfaye (Adama science and Technology university); Prof. ABEBE, Belay (Adama science and technology university)

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Session Classification: Wednesday Morning II

Track Classification: AfPS

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

Enhancing Radiative Cooling Power Using Ultra-Broadband Near-Unit Spectrally Selective Thermal Emitters Based On Metamaterial Structure.

Wednesday, 19 November 2025 11:00 (15 minutes)

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Abstract
Today, high energy consumption and thermal energy management are becoming crucial for sustainable stable environment. Recently, passive radiative cooling (PRC) has gained attention since it is one of the innovative strategies for reducing energy density in the environment without requiring any energy consumption. By selectively absorbing ultra-broadband infrared and properly reflecting solar irradiation, PRC can cool an environment below ambient temperature without using external energy. In this study, three different windows in the wavelength range of 2.5–5 μm, 8–13 μm, and 16–27 μm were selected for maximized net cooling power. Hence, we designed a cylinder-centered honeycomb structure spectral selective emitter for adjustment of radiation properties. The impacts of geometrical parameters on absorbance/emissivity performance were analyzed. At the optimized geometer, 138.2 Wm-2 of net cooling power was achieved during the day when exposed to 994 Wm-2 of direct solar irradiation. On the other hand, since sunlight is blocked at night, a net cooling power of 198 Wm-2 was achieved. An equilibrium temperature of 264 K and 244 K were achieved at daytime and nighttime, respectively, by considering the ambient temperature of 300 K. Even parasitic convection and conduction are taken into account; the cooler achieved the performance to cool below the ambient temperature. Furthermore, the designed cooler was polarization-independent and exhibited good emissivity over a wide range of incidence angles from 0° to 75°.

Key words: Metamaterial, Radiative Cooling, Emissivity, Atmospheric Wind

Primary authors: HURRISA, Tesfaye (Adama science and Technology university); Dr FEKADU, Tolessa (Adama science and technology university); Prof. BELAY, Abebe (Adama science and Technology University)

Presenter: HURRISA, Tesfaye (Adama science and Technology university)

Session Classification: Wednesday Morning II

Track Classification: AfPS

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

Structural and Optical Investigation on Undoped And Sm3+ Doped Na4Mg(WO4)3 Nanophosphors as an Efficient Photoluminescent Material

Wednesday, 19 November 2025 11:15 (15 minutes)

Newly developed white LEDs are replacing fluorescent lamps and other widely used lighting sources to minimize carbon dioxide emissions and energy loss due to their promising and useful properties such as longer lifespan, reliability, improvement in energy efficiency and luminous efficiency. Tungstates are effective host materials for rare-earth ions dopant for the production of luminescent materials or phosphors. The Intra-4f shell transitions shielded by rare earth ions provide effective and recognizable emissions across a variety of wavelengths. These materials are eco-friendly, cost-effective and safe. The pure Na4Mg(WO4)3 and NMW:xSm3+ (x= 0.25-3 mol%) samples were synthesized in this study by combustion synthesis and various analytical techniques were employed to investigate its structural, morphological and spectroscopic properties. The XRD peaks confirmed the monoclinic phase with the space group C12/c1. The Debye-Scherrer formula was used to determine the crystallite size which was in good agreement with the computed particle size by high-resolution transmission electron microscopy analysis. The field emission scanning electron microscopy confirmed the phosphor's porous nature. The Kubelka-Munk function was used to compute the band gap of the phosphors which is in the range 4.23 to 4.53 eV based on data from diffuse reflectance spectra. When stimulated at 405 nm, photoluminescence spectra showed four separate emission peaks, which corresponded to the energy level transitions from 4G5/2 to 6HJ (J = 5/2, 7/2, 9/2 and 11/2). It is also confirmed that the quenching effect observed between Sm3+ ions is prominently attributed to quadrupole-quadrupole interactions. The distinct reddish emission for 1.5 mol% concentration of NMW:xSm3+ with color purity of 98.1% suggests promising potential for applications in optoelectronics and other photoluminescent materials.

Primary authors: LALOTRA, Neha (SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA, J&K); Dr PATHANIA, Kamni (Central University of Jammu)

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Session Classification: Wednesday Morning II

Track Classification: AfPS

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

Nonextensive Black Hole Thermodynamics from Generalized Euclidean Path Integral and Wick's Rotation

Thursday, 20 November 2025 09:00 (15 minutes)

We extends the Euclidean path integral formalism to account for nonextensive thermodynamics. Concretely, we introduce a generalized Wick's rotation from real time t to imaginary time τ such that, $t \to -if_\alpha(\tau)$, where f_α a differentiable function and α is a parameter related to nonextensivity. The standard extensive formalism is recovered in the limit $\alpha \to 0$ and $f_0(\tau) = \tau$. Furthermore, we apply this generalized Euclidean path integral to black hole thermodynamics and derive the generalized Wick's rotations given the nonextensive statistics. The proposed formulation enables the treatment of nonextensive statistics on the same footing as extensive Boltzmann-Gibbs statistics. Moreover, we define a universal measure, η, for the nonextensivity character of statistics. Lastly, based on the present formalism, we strengthen the equivalence between the AdS-Schwarzschild black hole in Boltzmann-Gibbs statistics and the flat-Schwarzschild black hole within R\'enyi statistics and suggest a potential reformulation of the AdS_5/CFT_4 duality.

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Co-authors: Mrs MASMAR, Karima (Ibn zohr university); Prof. EL MOUMNI, Hasan (Ibn zohr university)

Presenter: BARZI, Faiçal

Session Classification: Thursday Morning I

Track Classification: AfPS

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

Non-collisions background studies with the ATLAS detector during the LHC Run-2 data taking

Thursday, 20 November 2025 09:30 (15 minutes)

Physics collision events at the Large Hadron Collider (LHC) can be affected, or even mimicked by non-collision sources such as beam-induced backgrounds (BIB), cosmic particles, and detector noise. Data collected during unpaired and empty proton bunch crossings provide background-enriched samples used to characterize these effects. BIB can impact detector performance and fake signals in searches for missing transverse energy or new physics, such as neutral long-lived particles.

This talk presents detailed studies of BIB in the ATLAS detector and their rates throughout Run-2. The characteristics of these non-collision backgrounds in the inner detectors and calorimeters are analyzed to improve their identification in physics analyses. Correlations between residual gas pressure and beam-gas events observed in the Beam Conditions Monitors (BCM) are studied through bump-pressure tests, along with associated fake jet rates. The performance of ATLAS beam background monitors is compared with Fluka simulations, and new Run-3 monitoring triggers are discussed using results from Run-2 data.

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Presenter: LAHBABI, FATIMA ZAHRA (University Hassan II, Faculty of sciences Ain Chock (MA))

Session Classification: Thursday Morning I

Track Classification: AfPS

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

Africa at Quantum Crossroads: From Coordination to Power

Wednesday, 19 November 2025 12:00 (1 hour)

Africa's scientific story is entering a new chapter powered by purpose.

The Africa Quantum Consortium (AQC) - standing proudly on the shoulders of, and in partnership with, the African Physical Society (AfPS) and the African Light Source (AfLS) - brings new energy, structure, and continental alignment to Africa's quantum march toward scientific sovereignty.

Together, these institutions form a living continuum of leadership:
AfPS united Africa's physicists and gave the continent a voice in global science.

AfLS envisioned the infrastructure to unlock Africa's material and medical frontiers.

AQC now connects these legacies to the future - embedding quantum science and technology within Africa's broader strategy for Big Science and Big Goals.

AQC's role is clear: to bridge research, industry, and policy to transform Africa from a participant in the quantum era to an architect of it.

Rooted in quantum, yet expansive in vision, AQC aligns the continent's scientific ecosystem toward a shared destination - impact, independence, and innovation.

This session unveils the architecture of that journey:

The State of Quantum in Africa White Paper — a data-driven snapshot of where we stand.

The Quantum Compact — a continental manifesto for scientific sovereignty.

The Pan-African Quantum Hackathon — the proving ground for Africa's next generation of innovators.

And the proposed IYQ Africa Roundtable — a unifying platform to align leadership and strategy beyond 2025.

This is more than coordination; it's continental coherence.

The Africa Quantum Consortium exists to make progress possible and turn ideas into alignment, and alignment into Africa's scientific power.

Big Science. Big Goals. One Africa.

Let's move from vision to velocity. Together. Now!

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Presenter: Mr MAZHANDU, Farai (Africa Quantum Consortium)

Session Classification: Wednesday Morning Plenary

Track Classification: AfPS

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

Experimental investigation on thermoelectric cooler to evaluate the efficiency of a passive temperature harmonization device

Thursday, 20 November 2025 09:45 (15 minutes)

Abstract. The Peltier modules are used for small scale cooling and refrigeration purposes at both domestic and industrial sectors. Portable refrigerators operated by Peltier element have been constructed, and experiments are conducted on air or/and water as coolants on module efficiency using water pump or fans, but the forced heat dissipation systems used poses problems that limit its application. In this study, experimental approach is used to evaluate the possibility to homogenize temperature in a box using a passive component such as an aluminum tube to evaluate a thermoelectric cooler efficiency. It was revealed that, in the laboratory conditions, the aluminum tube mode is more efficient than module only mode. The introduction of aluminum tube has created two zones (a colder zone inside and a less cold zone outside the aluminum tube). The COP value of aluminum tube mode is approximately 35% - 250% higher than that of module only mode. The introduction of the tube has improved heat exchange, homogenized, and lowered considerably the temperature within the cool box.

Primary authors: MANI KONGNINE, Damgou (université de lomé); MOUZOU, Essowè (université de lomé); N'WUITCHA , Kokou (universite de Lome); Dr KPELOU , Pali (Universite de lome); Mr ALLES, akilou (universite de lome)

Presenters: Dr KPELOU , Pali (Universite de lome); Mr ALLES, akilou (universite de lome)

Session Classification: Thursday Morning I

Track Classification: AfPS

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

Quantum Mechanical Formalism of Charged-Particle Beam Optics

Thursday, 20 November 2025 09:15 (15 minutes)

Quantum Mechanical Formalism of Charged-Particle Beam Optics

Sameen Ahmed Khan

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A formalism of Quantum Charged Particle Beam Optics is being developed since 1989 for both nonrelativistic and relativistic situations based on the nonrelativistic Schrödinger equation, Klein-Gordon equation, and the Dirac equation. This article gives glimpses of the basic framework of this formalism with the examples of round magnetic lens. This formalism has further led to quantum methodologies for treating light beam optics including polarization. The use of quantum methodologies results in an elegant 6×6 matrix differential operator for transition from the Helmholtz scalar wave optics to the Maxwell vector wave optics. We explicitly obtained this matrix differential operator in a series and exponential form respectively. The operator works for all types of light beams and its action is demonstrated to obtain the cross polarization in Gaussian light beams.

Keywords: Quantum Mechanics, Charged Particle Beam Optics; Light Polarization.

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Session Classification: Thursday Morning I

Track Classification: AfPS

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

Experimental Study of a Biomass Carbonization System with Heat Recovery for Hot Water Cogeneration.

Thursday, 20 November 2025 10:00 (15 minutes)

Carbonization is a thermochemical process that produces charcoal while releasing significant amount of heat. Systems designed to recover this thermal energy for co-, tri-, or multi-generation applications are attracting increasing interest. This study presents a carbonizer equipped with a heat recovery system for the cogeneration of hot water. The objective is to improve the recovery of thermal energy lost during carbonization and to investigate the influence of carbonization temperature on the biomass charcoal yield. The system integrates a copper coil (inner coil) placed in the combustion chamber, connected to an outer coil incorporated into the carbonizer and wrapped around the carbonization chamber. The results show that increasing the water flow rate reduces the maximum temperature in the carbonizer from 638.4 ℃ at 0 L/h to 472.2 ℃ at 50 L/h while slightly increasing the charcoal yield from 25.51 % to 25.76 %. Meanwhile, the efficiency of the heat recovery system is confirmed, with water temperature rises reaching 63.1 ℃ at 12.5 L/h and 24.6 ℃ at 50 L/h. This performance is attributed to the high heat transfer efficiency of the inner copper coil.
Keywords: Carbonization, Heat recovery, Cogeneration, Charcoal, Energy efficiency

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Session Classification: Thursday Morning I

Track Classification: AfPS

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

Scaling Quantum Education and Industry in Africa

Monday, 17 November 2025 11:00 (30 minutes)

This talk outlines a comprehensive strategy for establishing a robust quantum science and technology (QST) ecosystem in Africa. The talk begins by analyzing the current research landscape, identifying both existing strengths and critical gaps in the continent's QST topics. The talk then presents a multi-tiered educational blueprint, from core undergraduate foundations to specialized graduate paths, designed to cultivate a skilled quantum workforce. Furthermore, the talk maps these academic programs to both "ready" and "missing" industry clusters—from quantum computing and cryptography to advanced materials and pharmaceuticals—highlighting concrete opportunities for economic growth and technological innovation. The work of the Alexandria Quantum Computing Group (AleQCG) and QEgypt is showcased as a successful model for grassroots educational development, demonstrating a scalable pathway for Africa to actively participate in the global quantum revolution.

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Session Classification: Monday Morning

Track Classification: AfPS

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

COMBINE ROLE OF CERAMIC-CARBON FILTER FOR WASTEWATER TREATMENT

Wednesday, 19 November 2025 09:45 (15 minutes)

In many developing nations, like Ghana, where poor sanitation and agricultural runoff lead to widespread water contamination, access to safe drinking water is still a major problem. The creation and efficacy of a ceramic-carbon composite filter for the elimination of paraquat, a hazardous pesticide frequently detected in wastewater, are examined in this work. Locally produced kaolin and Mfensen clay were formulated into a hollow filter and fired to a temperature of 650℃. The filters were filled with activated carbon made from coconut oil and sucrose and activated at 650℃ for activation and increased porosity.
UV-Vis spectrophotometry set at a wavelength of 260 nm was utilized to determine the removal efficiency of a 0.2 mg/L paraquat solution used in batch filtration tests. The results showed that the filters removed over 95% of the paraquat in 10 minutes, with the best-performing filter, B2 (85 wt.%:15 wt.%), achieving 99.8% removal efficiency. The filters were appropriate for point-of-use water purification in rural areas due to their strong structural integrity, low manufacturing costs, and regeneration potential.
This study shows that ceramic–carbon composite filters provide an economical, environmentally friendly, and efficient way to reduce herbicide contamination in water. They also have a great deal of potential for local manufacturing and implementation in low-resource environments.

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Session Classification: Wednesday Morning I

Track Classification: AfLS

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

GCLS and the Proposal of a Light Sources Program for the Global South- Where we stand

Monday, 17 November 2025 14:45 (15 minutes)

The proposal of a second Latin American synchrotron in the Greater Caribbean is acquiring momentum. A synergy with similar proposals in Africa, Iran, Uzbekistan and with SESAME is arising, Several initiatives have already been carried out, A balance of the outcome, four years after the proposal will be presented, together with an analysis of the feasibility and social, economic, political return of the project. A special attention will be devoted to the possibility of starting by creating one or mor small accelerators as a network of (relatively) low-cost accelerators, like compact light sources, and to the possible role of international cooperation in the current geopolitical situation.

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Session Classification: Monday Afternoon I

Track Classification: AfLS

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

DR.

Thursday, 20 November 2025 11:15 (15 minutes)

ASSESSMENT OF BACKGROUND IONIZING RADIATION IN SELECTED DUMPSITE IN CALABAR, CROSS RIVER STATE, NIGERIA.

Abstract

Rapid urbanization in Calabar, Cross River State, Nigeria has led to the increase in the volume of waste generation. This study investigates background ionizing radiation levels in dumpsite environments within Calabar, Nigeria, utilizing gamma spectrometry and soil analysis techniques. An in-situ measurement approach was adopted using a chamber radiation survey metre (model 451P ion) to measure the background ionizing radiation level and a Geographical positioning system (G.P.S). The radiation values at each point at 10 metres distances as we move from one point of the dumpsite and was recorded accordingly. From this research it was discovered that the highest average level was 3.50 ±0.08 μSv/h at the Asi Ukpo dumpsite and it's slightly higher than the approved exposure limit by International Commission for Radiation Protection (ICRP) which is 1 mSv/h. A slight increase in the level of radionuclide: radium 226, thorium 232 and potassium 40 in the soil sample and water sample. However, from the result obtained there's a percentage of risk to the people living around these dumpsites which might suffice later if the exposure is not reduced or stopped.

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Session Classification: Thursday Morning II

Track Classification: AfPS

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

Water storage capacity of davemaoite constrained by in-situ volume measurements using a multi-anvil press

Friday, 21 November 2025 15:15 (15 minutes)

1.Introduction

Water significantly influences physical and chemical properties of Earth's mantle. Experimental and petrological studies suggest that the Earth's mantle transition zone is a large water reservoir. On the other hand, the water storage capacity of the lower mantle is still under debate. Although major lower-mantle minerals of bridgmanite and ferropericlase have limited water solubility, recent experimental and theoretical studies suggest davemaoite (CaSiO3 perovskite), a major lower-mantle mineral, can accommodate few weight percents of water [1,2]. Previous studies using a laser-heated diamond anvil cell showed negative volume changes up to 2 % under hydrous conditions and their link with significant hydrogen incorporation into the crystal structure. However, the water solubility is still unclear due to its unquenchable nature and previous difficulty to precisely collect in-situ experimental data.
In this study, we examined water solubility of davemaoite up to top-lower mantle conditions (30 GPa and 2100 K) based on in-situ precise volume measurements by means of advanced multi-anvil technology in combination with synchrotron X-ray diffraction [3,4].

2.Results

Our results showed volume difference of davemaoite under dry and hydrous conditions is limited (consistent within errors) at mantle expected temperatures. In addition, the crystal structure of davemaoite is cubic even under hydrous conditions along mantle geotherms. These results imply that limited water in the crystal structure.
Based on our findings, we suggest that peridotite is nearly dry after dehydration of hydrous minerals in the lower mantle, whereas crustal materials such as basaltic crust are likely serves as significant water reservoirs, providing new insights into the deep Earth's water cycle.

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Session Classification: Friday Afternoon I

Track Classification: AfLS

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

Ultrahigh Resolution 2D-RIXS at NanoTerasu BL02U

Thursday, 20 November 2025 12:00 (1h 30m)

NanoTerasu is Japan's newest 3GeV synchrotron radiation facility, which commenced user operations in 2024. NanoTerasu hosts a suite of advanced beamlines, including BL02U dedicated to ultrahigh-resolution Resonant Inelastic X-ray Scattering (RIXS). RIXS is a powerful, photon-in/photon-out spectroscopic technique that allows us to observe very low-energy excitations in materials. These excitations, arising from charge, spin, orbital, and lattice degrees of freedom, govern the fundamental physical properties and functions of materials, such as quantum materials and functional devices.

Achieving higher energy resolution in RIXS has been a long-standing challenge, since it traditionally comes at the cost of significantly lower measurement efficiency (throughput). To overcome this trade-off, we developed a state-of-the-art "2D-RIXS" spectrometer at BL02U. This spectrometer uses energy-dispersed incident X-rays, rather than monochromatic X-rays, allowing it to acquire multiple RIXS spectra simultaneously. This sophisticated design successfully circumvents the efficiency limitations of conventional spectrometers.

Through dedicated development and commissioning, the BL02U beamline has successfully achieved the ultrahigh energy resolution in the soft X-ray region. Our results have demonstrated a combined resolving power (E/ΔE) exceeding 58,000, corresponding to an energy resolution of 16.1 meV at the Cu L-edge (930 eV).

This presentation will provide an overview of the NanoTerasu facility and the general principles of RIXS. We will then detail the performance realized by the BL02U beamline and 2D-RIXS spectrometer. We will also touch upon the initial scientific results, showcasing the new opportunities available for investigating complex material properties.

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Session Classification: Thursday Morning Plenary

Track Classification: AfLS

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

LIBS spectroscopy for urban zone pollution monitoring

Wednesday, 19 November 2025 10:00 (30 minutes)

ABSTRACT:
After the invention of the first laser in 1960, the laser techniques become rapidly powerful investigation tools to bring concrete answers to various problems in quantum science and technology. Among different laser techniques the Laser induced breakdown spectroscopy (LIBS) is a technique of fast analysis of a multi-elemental compositions in various surroundings. It is a compact tool requiring only a minimal preparation of the sample (solid liquid or Gas). The LIBS Spectroscopy has many applications in several domains: environmental monitoring„ biomedical and pharmaceutical sciences, industries , military applications etc. Here we use the LIBS for the environmental monitoring (soil contamination , plant monitoring, concentration in metallic compounds). As examples the contamination of urban zone by heavy metals is considered to provide important information for population's health security. The LIBS spectroscopy allows to realize measurements of the concentration of heavy metals in soils and plants on the scale of ppb. Quantitative and qualitative LIBS measurements on barks exposed to the urban pollution are collected and analyzed, the samples of grounds polluted by the water evacuated from domestic effluents and those resulting from Industrial effluents in Dakar have been also collected and analyzed.

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Session Classification: Wednesday Morning I

Track Classification: AfPS

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

Green Synthesis and Characterization of Silver-Doped ZnO Nanoparticles Using Tobacco Leaf Extract: A Novel Hydrothermal Approach for Antibacterial and Antifungal Applications

Friday, 21 November 2025 10:45 (15 minutes)

Abstract
A green synthesis of pure zinc oxide and silver-doped zinc oxide nanoparticles (ZnO and Ag-ZnO NPs) is reported. This eco-friendly method utilizes tobacco leaf aqueous extract as a reducing and stabilizing agent, combined with a hydrothermal process at 120℃ for 6 hours to control nanoparticle formation. The study aimed to synthesize, characterize, and evaluate the antimicrobial activity of Ag-ZnO NPs. Characterization techniques included FTIR, XRD, SEM, UV–Vis, and PL spectroscopy, along with BET surface area analysis. FTIR confirmed functional groups, while X-ray diffraction (XRD) validated the hexagonal wurtzite ZnO structure. SEM imaging revealed a nanosheet morphology. UV–Vis analysis showed bandgap energy shifting with Ag doping: 2.02 eV (pristine ZnO) to 2.29 eV (3% Ag), 2.53 eV (5% Ag), and 3.53 eV (1% Ag). BET analysis indicated a decrease in surface area (132.251 m^2/g for pristine ZnO to 85.005 m^2/g for 1% Ag and 65.318 m^2/g for 5% Ag) and pore volume with higher Ag content. PL spectroscopy examined electron–hole recombination. Antimicrobial activity against Staphylococcus aureus, Escherichia coli, and Candida albicans was evaluated via disk diffusion assay, using ciprofloxacin and fluconazole as controls. Two-way ANOVA revealed significant differences in the zone of inhibition (ZOI) across varying concentrations and Ag doping levels ($p < 0.005$). Enhanced antibacterial activity against S. aureus was observed with increasing Ag doping, while E. coli showed limited susceptibility. The NPs exhibited antifungal activity against C. albicans. Bandgap, surface area, and antibacterial activity are controllable characteristics suggesting applications in biomedicine, photovoltaics, and photocatalysis.

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Session Classification: Friday Morning II

Track Classification: AfPS

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

DFT analysis of structural, electronic and optical properties of Ni and Zn doped CoS counter electrode for dye sensitized solar cells

Friday, 21 November 2025 11:00 (15 minutes)

In this study, first principles calculations are employed to investigate the structural, electronic, and optical properties of (Ni, Zn)xCo1−xS in its tetragonal phase. The optimized lattice parameters and negative defect formation energies confirm structural integrity and thermodynamic stability across doping levels. The calculations are performed using both the GGA and the HSE06 hybrid functional, ensuring an accurate description of electronic band structure. The system retains a direct band gap in all doped configurations, with a systematic reduction upon doping most pronounced in the co-doped case, demonstrating effective band gap engineering. Ni doping enhances electron localization through stronger Ni–S bonding, while Zn doping promotes electron delocalization, collectively improving charge transport. The band edges are dominated by hybridized Co(3d), Ni(3d), and S(3p) states, with Zn(4s) modulating valence band characteristics. A notable reduction in the effective masses of electrons and holes upon co-doping indicates enhanced carrier mobility and improved conductivity. Optical calculations reveal increased dielectric constant, strong absorption in the UV–visible range, and enhanced electrical conductivity, particularly in co-doped systems. These results establish (Ni, Zn)xCo1−xS as a highly tunable, stable, and efficient material, positioning it as a promising low-cost alternative to platinum-based counter electrodes in dye-sensitized solar cells. Moreover, this work offers crucial guidance for experimentalists in tuning CoS properties via doping for efficient dye sensitized solar cells.

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Session Classification: Friday Morning II

Track Classification: AfPS

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

Synthesis and characterization of Mo2C-Cu composites as an electrocatalyst for the hydrogen evolution reaction

Friday, 21 November 2025 11:15 (15 minutes)

Abstract:
The catalysts with metal particles as active sites play an important role for the understanding of hydrogen reaction mechanism for rational design of electrocatalysts. Recently, the application of metal organic frameworks (MOFs) in electrochemical hydrogen production has significantly increased. Here, a molybdenum-copper metal-organic framework (Mo-Cu MOF) was prepared by a simple wet chemical mixture as a precursor, followed by high-temperature carbonization. The molybdenum source was carbonized into molybdenum carbide nanocrystalline particles in the confined space of the Mo-Cu MOF, and the copper in the Mo-Cu MOF nodes for internal electron transfer to increase the efficiency of hydrogen production through electrocatalysis. X-ray diffraction analysis revealed the formation of η-MoC phase at a heat treatment temperature of 800℃.The MoC nanoparticles size increases from 3.8 nm to 23.73 nm with increase of synthesis temperature to 900℃ due to change of original η-MoC phase into β-Mo2C phase. The microstructure analysis by transmission electron microscopy revealed a gradual change of octahedral structure of MoxC-Cu with the increase of temperature. The structure of the MOF changed with the increase of temperature leading to a significant decrease in pore surface area and pore volume. The electrocatalytic hydrogen generation showed that the ŋ-MoC-Cu material synthesized at 800℃ exhibited an overpotential (η10) of -233 mV and a Tafel slope of 73 mV/dec. This indicates the role of copper in facilitating electron transfer within the material. Details about hydrogen production and mechanism will be explained during presentation.

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Session Classification: Friday Morning II

Track Classification: AfPS

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

Discrimination of Colombo-tantalite minerals from South Kivu Province (DRC) using XRF techniques

Friday, 21 November 2025 10:00 (30 minutes)

Coltan ore is one of the "3 T" minerals, which contains technologically important metals, namely tantalum and niobium. Market demand for these metals is growing as technology evolves, making them critical to manufacturing industries. However, the mineral supply chains are required to be conflict free so that Manufacturers do not, although involuntarily, contribute to promote "blood minerals". Such criticism has been evoked against some mineral processing companies in many conflict regions such as Sierra Leone and the Democratic Republic of Congo (DRC). Coltan minerals can be fingerprinted using several analytical methods, which are fairly sophisticated and expensive. This study elucidates the use of a portable XRF (PXRF) analysis technique to define the fingerprint of coltan mineral ores from the South Kivu province of the DRC, in order to trace them along their supply chains. It presents data from 15 samples from 4 artisanal mining areas, with discrimination diagrams. In order to validate the technique, the data were compared with those obtained by ICP-AES and PIXE analysis, and a good correlation was found among them. XRD and SEM-EDS analysis were performed to complete characterization of the composite samples from the 4 regions. The health risks associated with the presence of children and pregnant women in the artisanal mines of South Kivu are also assessed on the basis of the radionuclide elements that coltan ore may contain.
The results were recently published [1] and presenting their summary at the joint annual meeting of the African Light Source and African Physical Society is intended to highlight current initiatives in DRC while awaiting access to beam time. Given the number of sites and the quantity of samples requiring specific signatures, an African synchrotron laboratory would be a real opportunity for further studies if it were to become a reality in the coming years.

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Presenter: Prof. MUGUMAODERHA, Mac C. (Physics Department, ISP-Bukavu and TraCerLab)

Session Classification: Friday Morning I

Track Classification: AfLS

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

Photoionization of Low- and Highly-Charged Atomic Ions Using Synchrotron and Free-Electron Lasers

Friday, 21 November 2025 11:30 (30 minutes)

1- Introduction

New instruments have been employed for spectroscopic studies of gaseous astrophysical environments using synchrotron photoabsorption in the soft X-ray range (0.1–2 keV) at the Elettra Laboratory in Trieste, Italy.
The first instrument used in this study is the Electron Beam Ion Trap (EBIT) [1]. The second is a newly developed setup called the OctoIonGuide (OIG), which was designed and characterized at the CNR laboratory in Trieste. The primary puropose of this apparatus is the investigation of low- and highly-charged atomic ions. Preliminary results obtained from the EBIT will be presented for different charge states of oxygen and nitrogen. In addition, the characterization of the OIG instrument will be discussed, including mass spectra of various noble gases and the quantification of ion counts. These measurements are expected to provide valuable insights for upcoming astrophysical observations, facilitating the physical diagnostics of weakly ionized gas distributed throughout the universe [1–3].
2- Results
The Electron Beam Ion Trap (EBIT) has been utilized for high-resolution measurements, as shown in Fig. 1. The photoionization of N^{3+} ions were measured using the EBIT, which served both to produce and confine the ions. The photoion yield of N^{3+} was recorded for the transition process: $1s^2\ 2s\ 2p\ {}^3P^\circ \longrightarrow 1s\ 2s\ 2p^2\ [{}^4P]\ {}^3P$. In contrast, Fig. 2 presents the first results of the photoionization of Xe^+ ions generated in the OIG. The extracted and mass-selected Xe^+ ion beam was merged with the synchrotron photon beam. The resulting photoions were separated from the primary beam, mass-analyzed, and detected using a channeltron optimized for positive-ion detection.

Fig.1 Photoionization of Nˆ(3+): 1s2 2s2p 3 P◦ ⟶ 1s2s2p2 [4 P] 3P Fig2. Photoionization of Xe+ from OIG setup.
From EBIT setup.

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Session Classification: Friday Morning II

Track Classification: AfLS

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

Sound velocity measurements by inelastic x-ray scattering using a synchrotron light source

Friday, 21 November 2025 09:00 (30 minutes)

1. Introduction

The Earth's interior is one of the forefronts of Earth science, and the inner core, the center part of the Earth, has been a long-term research topic. The Earth's inner core, which is approximately three-quarters the size of the Moon, is considered to be mostly iron. However, laboratory experiments and theoretical studies have shown that the density and sound velocities of the inner core, based on the seismic models, Preliminary Reference Earth Model (PREM) [1], cannot be explained by pure iron [2,3,4]. Therefore, it is estimated that the inner core contains some light elements. To determine the type and quantity of light elements present in the inner core, it is important to accurately measure the compression properties and sound velocities of iron and iron-light element alloys under high-pressure and temperature conditions. Many high-pressure compression experiments under the core conditions have been conducted using a diamond anvil cell with a synchrotron light source. On the other hand, sound velocity measurements under these conditions have not been well studied due to technical difficulties.

2. Results

We have been working to improve the method of measuring the sound velocity of metals under high-pressure conditions by inelastic x-ray scattering (IXS). To obtain weak IXS contributions from small, thin samples at multi-megabar pressures, we developed a newly designed Soller screen system at BL43LXU beamline of SPring-8, a third-generation synchrotron radiation facility in Japan. This system allows us to reduce noise as much as possible [5]. We also improved the shape of the diamond anvil to maintain stable pressure during long-term IXS measurements [3]. These improvements enabled us to successfully perform high-pressure sound velocity measurements of pure iron and other metals at pressures above 3 megabars and at ambient temperatures [3,4]. Additionally, we developed a portable laser heating system (COMPAT) [6] to conduct sound velocity measurements at high temperatures. We have also conducted sound velocity measurements of iron-light element alloy under high-temperature conditions. Here, we present our recent advances in IXS sound velocity measurements at high pressure and temperature.

This abstract is one of the contributions from Commission of Physics of Minerals (CPM), International Mineralogical Association (IMA).

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Primary author: IKUTA, Daijo (Institute for Planetary Materials, Okayama University)

Co-authors: OHTANI, Eiji (Tohoku University); FUKUI, Hiroshi (RIKEN); SAKAI, Takeshi (Ehime University); SAKAMAKI, Tatsuya (Tohoku University); HEID, Rolf (Karlsruhe Institute of Technology); ISHIKAWA, Daisuke (RIKEN); BARON, Alfred Q. R. (RIKEN)

Presenter: IKUTA, Daijo (Institute for Planetary Materials, Okayama University)

Session Classification: Friday Morning I

Track Classification: AfLS

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

Synchrotron and other CT data of South African Dinocephalians

Thursday, 20 November 2025 16:10 (15 minutes)

1.Introduction
Dinocephalians are a non-mammalian therapsids (mammalian ancestors) that lived during the Permian (˜260 million years ago) [1,2, 3]. They are divided into two main groups: carnivorous (anteosaurs) and herbivorous (tapinocephalians) [1,4,5]. What unites dinocephalians as a group is their disproportionately large heads and excessively thick skulls, which can be around 10 cm thick [6].
Deciphering the evolutionary relationship between species of dinocephalians has been historically difficult, primarily due to two factors: (a) a lack of postcranial material and (b) of detailed analysis of the available cranial material. The primary cause of the latter is the extremely thick skulls that studying the braincase (a highly informative anatomical region for evolutionary studies) difficult. Recent advancements in synchrotron technology and accessibility have enabled the scanning of several dinocephalian skulls, providing us with much greater detail than ever before.

2.Results
The scanning of specimens AM 4950 and BP/1/8152 at the European Synchrotron Facility has enabled a more detailed comparison of dinocephalian cranial sutures. For AM 4950, a cranial abscess was discovered that may shed light on therapsid immunology and dinocephalian social behavior [7,8]. Current work on specimen BP/1/8152, including its cranial sutures and braincase, has allowed it to be identified as a juvenile dinocephalian and is currently illustrating how extreme bone growth occurs in dinocephalians. Both these specimens are just two examples of the benefits of synchrotron to mammalian evolution.

Primary author: LAFFERTY, Tristen (University of the Witwatersrand)

Presenter: LAFFERTY, Tristen (University of the Witwatersrand)

Session Classification: Thursday Afternoon II

Track Classification: AfLS

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

The osteohistology of Orthosuchus stormbergi using synchrotron radiation microcomputed tomography

Thursday, 20 November 2025 16:25 (15 minutes)

Orthosuchus stormbergi was a small bodied, Early Jurassic crocodyliform. It is a representative of a diverse assemblage of early branching crocodylomorph taxa from the upper Elliot Formation of South Africa. The life history of these early branching taxa remains poorly understood, with only sparse investigations into their osteohistology, yet species like *Orthosuchus* have potential to inform about origins of slow growth on the stem leading to crown crocodilians. In order to elucidate the growth patterns of *Orthosuchus*, we used propagation phase contrast X-ray synchrotron micro-computed tomography to virtually image the osteohistology of the postcrania of two specimens, the type (SAM-PK-K409) and a referred specimen (BP/1/4242). In total, we scanned nine mid-diaphyseal sections of the humerus, radius, ulna, radiale, femur, tibia, fibula, and a rib. We then compared our results to a broad set of histological sections of crocodylomorph taxa from the published literature. The most predominant bone tissue type was lamellar-zonal with a few patches of woven and parallel-fibred bone. Four to five lines of arrested growth were seen in the type specimen and six to seven were observed in the referred specimen. All the elements were generally thick walled and compact, most notably the radius and ulna. Our virtual osteohistological sections are the first for an early branching crocodyliform, and the broad sample of skeletal elements makes Orthosuchus a key anchor point for understanding the plesiomorphic life history traits of the clade. We show that early branching Crocodyliformes had slow growth and that the relatively thick cortices of *Orthosuchus* potentially indicate differing habitual behaviours from the co-occurring *Sphenosuchus acutus*.

Primary authors: Dr WEISS, Bailey Mark (Evolutionary Studies Institute, University of the Witwatersrand); Dr DOLLMAN, Kathleen (European Synchrotron and Radiation Facility); Prof. CHOINIERE, Jonah N. (Evolutionary Studies Institute, University of the Witwatersrand); Dr BROWNING, Claire (Iziko Museums); Prof. BOTHA, Jennifer (GENUS and Evolutionary Studies Institute, University of the Witwatersrand)

Presenter: Dr WEISS, Bailey Mark (Evolutionary Studies Institute, University of the Witwatersrand)

Session Classification: Thursday Afternoon II

Track Classification: AfLS

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

The World of Atoms at the Attosecond Time Scale

Monday, 17 November 2025 12:15 (1h 15m)

When an intense laser interacts with a gas of atoms, high-order harmonics are generated. In the time domain, this radiation forms a train of extremely short light pulses, of the order of 100 attoseconds. Attosecond pulses allow the study of the dynamics of electrons in atoms and molecules, using pump-probe techniques. This presentation will highlight some of the key steps of the field of attosecond science.

Primary author: Prof. L'HUILLIER, Anne (Lund University)

Presenter: Prof. L'HUILLIER, Anne (Lund University)

Session Classification: Opening Plenary Session

Track Classification: AfPS

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

LAAAMP Overview

Monday, 17 November 2025 14:30 (15 minutes)

Overview of LAAAMP

Primary author: MTINGWA, Sekazi (Massachusetts Institute of Technology & Brookhaven National Laboratory& African Laser Centre)

Presenter: MTINGWA, Sekazi (Massachusetts Institute of Technology & Brookhaven National Laboratory& African Laser Centre)

Session Classification: Monday Afternoon I

Track Classification: AfLS

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

Archeological Materials

Monday, 17 November 2025 15:00 (30 minutes)

Archeological Materials

Primary author: CASTANO, Victor (Universidad Nacional Autonoma de Mexico)

Presenter: CASTANO, Victor (Universidad Nacional Autonoma de Mexico)

Session Classification: Monday Afternoon I

Track Classification: AfLS

Contribution ID: **53** Type: **not specified**

SESAME BM02-IR Beamline: present and future.

Monday, 17 November 2025 16:30 (30 minutes)

SESAME BM02-IR Beamline: present and future.

Primary authors: KAMEL, Gihan (SESAME Light Source); KAMEL, Gihan (SESAME: Synchrotron--light for Experimental Science and Applications in the Middle-East)

Presenter: KAMEL, Gihan (SESAME Light Source)

Session Classification: Monday Afternoon II

Track Classification: AfLS

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

Scientific opportunities at the SESAME Synchrotron X-rays beamlines.

Monday, 17 November 2025 16:00 (30 minutes)

Scientific opportunities at the SESAME Synchrotron X-rays beamlines.

Primary author: HARFOUCHE, Messaoud (SESAME)

Presenter: HARFOUCHE, Messaoud (SESAME)

Session Classification: Monday Afternoon II

Track Classification: AfLS

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

Science Impact and perspectives at SESAME

Monday, 17 November 2025 15:30 (15 minutes)

Science Impact and perspectives at SESAME

Primary author: LAUSI, Andrea (SESAME)

Presenter: LAUSI, Andrea (SESAME)

Session Classification: Monday Afternoon I

Track Classification: AfLS

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

LEAPS Data Strategy and Open Science

Tuesday, 18 November 2025 17:15 (30 minutes)

LEAPS Data Strategy and Open Science

Presenter: GOTZ, Andrew (ESRF)

Session Classification: Tuesday Afternoon III

Track Classification: AfLS

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

Synchrotron radiation enabled advances in Human Bioarchaeology: Current research and future potential

Wednesday, 19 November 2025 14:00 (30 minutes)

Science and Technology in Archaeology and Culture Research Center (STARC) of The Cyprus Institute

Primary author: Dr LORENTZ, Kirsi (Cyprus Institute)

Presenter: Dr LORENTZ, Kirsi (Cyprus Institute)

Session Classification: Wednesday Afternoon I

Track Classification: AfLS

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

”Molecular movies of Biomolecules in action with X-Ray Free Electron Lasers and status on building the world’s first compact XFEL”

Wednesday, 19 November 2025 14:30 (30 minutes)

“ Molecular movies of Biomolecules in action with X-Ray Free Electron Lasers and status on building the world’s first compact XFEL”

Petra Fromme
The Biodesign Center for Applied Structural Discovery and School of Molecular Sciences, Tempe, Arizona 85287- 5001
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Biological processes are highly dynamic, while most of the structures of biomolecules determined by X-ray crystallography and cryo-EM represent a static picture of the molecule frozen in time and space. Serial Femtosecond crystallography (SFX) provides a novel concept for structure determination, where X-ray diffraction “snapshots” are collected from a fully hydrated stream of nanocrystals, using femtosecond pulses at high energy X-ray free-electron lasers [1,2]. The femtosecond pulses from XFELs are so strong that they destroy any sold material but they are shorter than the time-scale of most damage processes, thereby femtosecond crystallography overcomes the problem of X-ray damage in crystallography [3]. Fs crystallography extends to atomic resolution [4,5] and has been applied to important membrane protein drug targets crystallized in lipidic environments [6-10]. Experiments on the proof of principle for time resolved serial femtosecond crystallography [11-16] pave the way for the determination of molecular movies of the dynamics of proteins “at work”. In my talk I show highlights of recent structural discoveries with X-ray Free Electron lasers [17-21] and report on the new development of compact X-ray Free Electron Lasers at Arizona State University.

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Primary authors: Prof. FROMME, Petra (Arizona State University); LAMAY, Christopher

Presenter: Prof. FROMME, Petra (Arizona State University)

Session Classification: Wednesday Afternoon I

Track Classification: AfLS

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

FinEstBeAMS atmospheric science beamline at MAX IV

Wednesday, 19 November 2025 17:45 (30 minutes)

FinEstBeAMS atmospheric science beamline at MAX IV

Primary author: Dr ERIKSSON, Axel

Presenter: Dr ERIKSSON, Axel

Session Classification: Wednesday Afternoon III

Track Classification: AfLS

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

MAXIV FemtoMAX

Wednesday, 19 November 2025 18:15 (30 minutes)

MAXIV FemtoMAX

Primary author: Dr LARSSON, Jorgen (MAXIV)

Presenter: Dr LARSSON, Jorgen (MAXIV)

Session Classification: Wednesday Afternoon III

Track Classification: AfLS

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

Synchrotron Earth and Environmental Science (SEES) program

Wednesday, 19 November 2025 17:15 (30 minutes)

Synchrotron Earth and Environmental Science (SEES) program

Primary author: Prof. CAMPBELL , Andrew J. (University of Chicago)

Presenter: Prof. CAMPBELL , Andrew J. (University of Chicago)

Session Classification: Wednesday Afternoon III

Track Classification: AfLS

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

XAFS observes chemical states and local structures of materials

Tuesday, 18 November 2025 12:00 (1h 30m)

XAFS observes chemical states and local structures of materials
Hitoshi Abe1,2

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Institute of Materials Structure Science(IMSS), KEK, operates two synchrotron rings, Photon Factory (PF) and PF-AR (Advanced Ring). PF is operated with the beam energy of 2.5 GeV, and PF-AR with 6.5 GeV or 5. 0GeV to provide higher x-ray energy. There are about 50 end stations including 6 x-ray absorption fine structure (XAFS) beamlines in hard x-ray region: 9A, 9C, 12C, 15A1, AR-NW2A and AR-NW10A.
XAFS is one of the most demanded methods at synchrotrons and is used to study various materials such as catalysts, batteries, functional oxides, semiconductors, minerals and environmental samples. XAFS is usually divided into two characteristic regions, x-ray absorption near edge structure (XANES) and extended x-ray absorption fine structure (EXAFS). XANES is the region of the spectrum from just below the absorption edge to ˜50-70 eV above the edge. XANES reflects electronic states of elements of interest such as valence states, chemical states and coordination symmetry. EXAFS includes the other higher energy region above XANES and analysed to investigate local structures of elements of interest, e.g. bond length and coordination number. We will share recent topics of our XAFS studies performed at our facility. In addition, I would suggest potential topics to be studied at the AfLS in the context of natural resources in the African continent.

Primary author: ABE, Hitoshi (Photon Factory (PF), Institute of Materials Structure Science (IMSS), High Energy Accelerator Research Organization (KEK))

Presenter: ABE, Hitoshi (Photon Factory (PF), Institute of Materials Structure Science (IMSS), High Energy Accelerator Research Organization (KEK))

Session Classification: Tuesday Morning Plenary

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

Introduction to 2025 African Light Source Detectors Tutorial

Tuesday, 18 November 2025 12:00 (5 minutes)

It is our pleasure to announce the first African Light Source Detectors Tutorial, which will be held in the afternoon of Tuesday, 18 November 2025, 12-17h30 GMT+2 in conjunction with the joint African Light Source / African Physical Society conference.

Detectors are crucially important for the science performed at synchrotron and Free-Electron Lasers, and innovative detectors often open up new scientific opportunities and research fields. The last two decades have shown a strong increase in the number of custom developed X-ray imagers, with activities at many facilities throughout the world.

This half-day tutorial will give synchrotron users as well as beamline staff an introduction in the technology involved in detectors components and systems. The lectures will be given by senior experts from leading European detectors groups, but will be at a level that can be followed by non-experts.

Learn directly from leading European detectors experts, who will share insights, experiences, and the latest developments in the field – all presented in an engaging, easy-to follow format suitable for non-specialists.

Please register for the tutorial below, then be sure to register for the main conference as well.

Primary author: Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany)

Co-authors: Dr BERGAMASCHI , Anna (PSI, Switzerland); PENNICARD, David (DESY); Dr FRÖJDH , Erik (PSI, Switzerland); LEHNER, Frank (DESY); Dr VEALE , Matthew (UKRI-STFC, UK)

Presenters: Dr BERGAMASCHI , Anna (PSI, Switzerland); PENNICARD, David (DESY); Dr FRÖJDH , Erik (PSI, Switzerland); LEHNER, Frank (DESY); Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany); Dr VEALE , Matthew (UKRI-STFC, UK)

Session Classification: Detectors Tutorial

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

Introduction to X-ray detectors

Tuesday, 18 November 2025 12:05 (50 minutes)

Primary author: Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany)

Presenter: Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany)

Session Classification: Detectors Tutorial

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

Photon counting detectors

Tuesday, 18 November 2025 13:00 (50 minutes)

Primary author: Dr BERGAMASCHI , Anna (PSI, Switzerland)

Presenter: Dr BERGAMASCHI , Anna (PSI, Switzerland)

Session Classification: Detectors Tutorial

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

Integrating detectors

Tuesday, 18 November 2025 14:30 (50 minutes)

Primary author: Dr PENNICARD , David (DESY-Hamburg, Germany)

Presenter: Dr PENNICARD , David (DESY-Hamburg, Germany)

Session Classification: Detectors Tutorial

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

Sensors for low-E, medium-E and high-E photons

Tuesday, 18 November 2025 15:30 (50 minutes)

Primary author: Dr VEALE , Matthew (UKRI-STFC, UK)

Presenter: Dr VEALE , Matthew (UKRI-STFC, UK)

Session Classification: Detectors Tutorial

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

DAQ, data handling, data reduction and AI/ML

Tuesday, 18 November 2025 16:30 (50 minutes)

Presenter: Dr FRÖJDH , Erik (PSI, Switzerland)

Session Classification: Detectors Tutorial

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

Detectors Tutorial Summary and Evaluation

Tuesday, 18 November 2025 17:20 (10 minutes)

Primary author: PARTICIPANTS, All

Co-authors: Dr BERGAMASCHI , Anna (PSI, Switzerland); LEHNER, Frank (DESY); FRÖJDH; Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany); Dr VEALE , Matthew (UKRI-STFC, UK); PENNICARD

Presenters: PARTICIPANTS, All; Dr BERGAMASCHI , Anna (PSI, Switzerland); LEHNER, Frank (DESY); FRÖJDH; Prof. GRAAFSMA, Heinz (DESY-Hamburg, Germany); Dr VEALE , Matthew (UKRI-STFC, UK); PENNICARD

Session Classification: Detectors Tutorial

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

Bulk electronic structure of lanthanum hexaboride (LaB6) by hard x-ray angle-resolved photoelectron spectroscopy

Friday, 21 November 2025 13:00 (45 minutes)

Bulk electronic structure of lanthanum hexaboride (LaB6) by hard x-ray angle-resolved photoelectron spectroscopy

SIAM II Thailand Photon Source

Primary author: Dr RATTANACHATA, Arunothai (SIAM Thai Light Source)

Presenter: Dr RATTANACHATA, Arunothai (SIAM Thai Light Source)

Session Classification: Friday Morning Plenary

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

AfLS / AfPS Conference Opening

Monday, 17 November 2025 12:00 (15 minutes)

AfLS Ceremonial Calling Stick - Profs Simon Connell, Philip Oladijo
Introduction of Speaker - Prof Ahmadou Wague

Primary author: OLADIJO, Philip Oluseyi (Botswana International University of Science and Technology)

Co-authors: WAGUE, Ahmadou (African Physical; Society); CONNELL, Simon (University of Johannesburg)

Presenters: WAGUE, Ahmadou (African Physical; Society); OLADIJO, Philip Oluseyi (Botswana International University of Science and Technology); CONNELL, Simon (University of Johannesburg)

Session Classification: Opening Plenary Session

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

Overview of the Diamond Light Source

Friday, 21 November 2025 16:00 (30 minutes)

CEO of Diamond Light Source

Primary author: Dr BOTTON, Gianluigi (Diamond Light Source Ltd)

Presenter: Dr BOTTON, Gianluigi (Diamond Light Source Ltd)

Session Classification: Friday Afternoon II

Track Classification: AfLS

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

The Evolution of the Maxillary Canal in Therocephalians: Implications for Facial Sensitivity and Phylogeny.

Thursday, 20 November 2025 16:40 (15 minutes)

Abstract
The maxillary canal is an osseous tube, in the upper jaw that houses key branches of the trigeminal nerve, and plays a crucial role in facial sensitivity and motor function in vertebrates [1,2]. Although its evolution has been widely studied in the sister taxon, Cynodontia (which includes modern mammals), far less is known about this structure in therocephalians [2,3]. Therocephalians are a morphologically diverse clade of Permo-Triassic therapsids, that occupied a wide range of ecological niches [4,5]. The diversity of therocephalians suggests the substantial variation in its maxillary canal anatomy, but no broad comparative analysis has been conducted [3,4, 5,6]. This study investigates the evolution, morphology, and developmental implications of the maxillary canal across therocephalian subclades. Particularly focusing on its relationship to postcanine dental variation, the anterior expansion of the canal into the premaxilla and the ancestral condition of the canal in both cynodonts and therocephalians [1,2]. High-resolution CT scans of multiple therocephalian taxa will be used to reconstruct the maxillary canal in three dimensions, allowing comparisons across phylogeny [7], ecology, and morphology. By clarifying the ancestral condition of the maxillary canal in both therocephalians and their sister group, the cynodonts, this research will refine our understanding of cranial, sensory, and developmental evolution along the mammalian stem lineage, shedding light on the origins of key mammalian traits.

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Primary author: Ms SEBUSI, Reitumetse

Presenter: Ms SEBUSI, Reitumetse

Session Classification: Thursday Afternoon II

Track Classification: AfLS

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

The recent status of High Energy Photon Source (HEPS)

Monday, 17 November 2025 14:00 (30 minutes)

The recent status of High Energy Photon Source (HEPS)
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One of the important tendencies in the development of synchrotron radiation sources is low emmitance. Low emmitance storage rings could provide higher brilliance and better coherence, which are very important for almost all kinds of experiments in synchrotron radiation facilities. The 4th generation synchrotron radiation facilities can provide 2 or 3 orders of higher brilliance and coherence comparing with 3rd generation ones.
In the meantime, the successful construction of Shanghai Synchrotron Radiation Facility and the great achievements in the research in this facility, inspire the users to build the new and high-performance light sources in China. In the view point of regional factors, the vast in territory of China requires the reasonable distribution of synchrotron radiation facilities which support the scientific and technological research, in order to farthest satisfy the demands of users from different regions.
Based on the above reasons, we are building a new synchrotron radiation facility in the region around Beijing: High Energy Photon Source (HEPS). The designed electron energy of HEPS is 6GeV and the emmitance is lower than 0.1nmrad. This machine can provide the hard X-ray with brilliance higher than 1022ph/s/mm2/mrad2/0.1%BW and photon energy higher than 300keV.
The construction of HEPS started in June 2019, including a 500MeV LINAC, a 6GeV booster, a 1360m-circunference storage ring, 14 public beamlines and 1 test optical beamline, as well as the auxiliary facilities and building. Before the start-up of HEPS, the R&D project (HEPS-TF) was supported during 2016-2019. The Platform for Advanced Photon Source (PAPS) was supported in 2017 in order to provide a field for technology research and the assembling of the instruments of HEPS.
The installation of LINAC started in March 2022, commissioning in March 2023. In June 2023, the electron energy of LINAC reached to 500MeV, and the bunch charge reached to 7nC.
The installation of booster started in August 2022, commissioning in July 2023. After 4 months of commissioning, the electron energy reached to 6GeV and bunch charge to 5nC, in November 2023.
The installation of storage ring started in February 2023. In July 23 2024, we started the commissioning of storage ring. Now the beam current can reach to 100mA and the emmitance was 56.8pmrad. The first synchrotron light from insertion device was firstly obtained in October 12, 2024.
During the installation of storage ring, the front-ends of beamlines were installed in Oct. 21, 2022. The first monochromator was installed in Dec. 15, 2023. The commissioning of beamlines were started in Sep. 2024.
In Oct. 29, 2025, HEPS passed the performance acceptance organized by the Chinese Academy of Sciences. A suite of world-class performance beamlines has been commissioned, such as state-of-the-art the hard x-ray imaging beamline and the structural dynamics beamline. Early experiments have fully demonstrated HEPS's exceptional capabilities: deep penetration, ultra-high brightness and coherence. HEPS is now poised to serve as a premier platform for original and innovative research across basic and engineering sciences and will open to global users in 2026.

Primary author: DONG, Yuhui (Institute of High Energy Physics, CAS)

Presenter: DONG, Yuhui (Institute of High Energy Physics, CAS)

Session Classification: Monday Afternoon I

Track Classification: AfLS

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

How AI Is Changing the Ways Experiments Are Conducted at Synchrotron Light Sources

Thursday, 20 November 2025 14:00 (30 minutes)

How AI Is Changing the Ways Experiments Are Conducted at Synchrotron Light Sources

Qun Shen
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National Synchrotron Light Source II (NSLS-II)
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Synchrotron light sources have been developing rapidly since the 1980's when first dedicated light source facilities started operations. These light sources essentially extend our human vision and allow us to see and investigate tiny things from microstructures to molecules and atoms, in many cases in-situ and under operating conditions. Such research activities have made substantial scientific and technological impacts on energy, microelectronics, quantum information, synthesis and manufacturing, human health, and the environment.

In recent years, data science and the use of artificial intelligence (AI) and machine learning (ML) have been recognized as critical part of running experiments at synchrotron facilities. This field is developing rapidly, leading to fundamental changes in how certain experiments are being conducted at synchrotron beamlines. In this talk, I will present some examples of this new development trend at National Synchrotron Light Source II (NSLS-II), and how potentially such development will change how experiments are conducted at synchrotrons.

National Synchrotron Light Source II is a U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Brookhaven National Laboratory under Contract No. DE-SC0012704.

Session Classification: Thursday Afternoon I

Track Classification: AfLS

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

Comparative analysis of kimberlite Rock Using Activation Technique

Wednesday, 19 November 2025 11:30 (15 minutes)

Kimberlite rocks are the primary hosts of diamonds. These rocks have natural radioisotopes that originated from elements formed during supernova processes. These rocks produce new radioisotopes when activated. This work compares the spectral lines of unirradiated kimberlite with irradiated kimberlite. Experimentally, two kimberlites rock with identification numbers S11 and K6 were prepared, and the Aarhus 100 MeV microtron injector was incident on a target to produce a bremsstrahlung photon to irradiate the S11 kimberlite rock to become radioactive. The S6 kimberlite was not irradiated. Both kimberlite samples were detected under high-purity germanium detectors to acquire spectral line data. Gamma spectroscopy analysis was performed on the high-purity germanium data, and the ENDF/TENDL nuclear database was used to identify all the spectral lines in both spectra. The 511 keV PET peak in the S11 kimberlite showed the highest peak as compared with the K6 sample. In contrast, potassium-40 exhibits the highest half-life of 1.248 x 109 years in both spectra, which are crucial in mineralogy processes and radiology safety in the environment.

Primary author: BENTUM, Gideon (University of Johannesburg)

Presenter: BENTUM, Gideon (University of Johannesburg)

Session Classification: Wednesday Morning II

Track Classification: AfPS

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

Light Sources

Tuesday, 18 November 2025 14:30 (15 minutes)

Report of the Light Source WG and chapter of the ASFAP report.

Presenter: KAMEL, Gihan (SESAME Light Source)

Session Classification: ASFAP - AfLS Symposium I

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

Compact Light Sources

Tuesday, 18 November 2025 14:45 (15 minutes)

Report of the Compact Light Sources WG and chapter of the ASFAP report.

Primary author: Dr SERAFINI, Luca

Presenter: Dr SERAFINI, Luca

Session Classification: ASFAP - AfLS Symposium I

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

Condensed Matter & Materials Physics

Tuesday, 18 November 2025 15:00 (15 minutes)

Report of the Condensed Matter & Materials Physics WG and chapter of the ASFAP report.

Primary author: IMANE , ADRAOUI

Presenter: IMANE , ADRAOUI

Session Classification: ASFAP - AfLS Symposium I

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

Atomic & Molecular Physics

Tuesday, 18 November 2025 15:30 (15 minutes)

Report of the Atomic & Molecular Physics WG and chapter of the ASFAP report

Primary author: KENMOE, Stephane

Presenter: KENMOE, Stephane

Session Classification: ASFAP - AfLS Symposium I

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

Biophysics

Tuesday, 18 November 2025 15:15 (15 minutes)

Report of the Biophysics WG and chapter of the ASFAP report.

Primary author: MÜLLER-NEDEBOCK, Kristian (University of Stellenbosch)

Presenter: MÜLLER-NEDEBOCK, Kristian (University of Stellenbosch)

Session Classification: ASFAP - AfLS Symposium I

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

Summary of recommendations

Tuesday, 18 November 2025 15:45 (30 minutes)

Summary of recommendations of the ASFAP report as they relate to light sources.

Primary author: KAMEL, Gihan (SESAME Light Source)

Presenter: KAMEL, Gihan (SESAME Light Source)

Session Classification: ASFAP - AfLS Symposium I

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

Discussion of ASFAP Report wrt Light Sources

Tuesday, 18 November 2025 16:15 (45 minutes)

Discussion of ASFAP Report wrt Light Sources

Session Classification: ASFAP - AfLS Symposium II

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

X-ray Imaging at Diamond Light Source

Thursday, 20 November 2025 14:45 (50 minutes)

12h30 – 12h45: Julia Parker
12h45 - 13h00: Darren Batey
13h00 – 13h15: Genoveva Burca
13h15 – 13h30 : Christoph Rau
13h30 – 13h45: Christopher Allen, Advanced imaging with electrons at ePSIC Diamond Light Source.
13h45 – 14h00: Sharif Ahmed

Session Classification: Thursday Afternoon I

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

I12 (JEEP) – the Joint Engineering, Environmental, and Processing facility at Diamond Light Source

Thursday, 20 November 2025 15:35 (15 minutes)

Primary author: BURCA, Genoveva (Diamond Light Source)

Presenter: BURCA, Genoveva (Diamond Light Source)

Session Classification: Thursday Afternoon I

Contribution ID: **89** Type: **not specified**

The Imaging and Microscopy Group at Diamond Light Source

Thursday, 20 November 2025 14:30 (15 minutes)

Primary author: PARKER, Julia (Diamond Light Source)

Presenter: PARKER, Julia (Diamond Light Source)

Session Classification: Thursday Afternoon I

Contribution ID: **90** Type: **not specified**

The European Battery Hub at ESRF - History, concept and operation

Friday, 21 November 2025 12:15 (45 minutes)

Following an upgrade programme, the ESRF performance has been increased a hundredfold, enabling more experiments in less time. New access modes were designed to optimise the use of beamtime and to facilitate collaborations between researchers on topics with strong societal impact. From 2021 to 2024, CEA and the ESRF tested multi-beamline access through the creation of a first pilot hub dedicated to battery characterisation. Since 2024, the Battery Hub has brought together ESRF scientists and European research groups (Chalmers Univ., HIU-KIT, Bayreuth Univ., CNRS, CEA-Liten, CEA-Irig). These experts in battery characterisation are sharing around 80 shifts each semester across six beamlines (BM32, ID13, ID31, ID16B, ID26, ID20), enabling multiscale studies of battery materials (crystallographic structure, morphology, chemical and electronic environment) and related reaction mechanisms from atomic scale to real battery cell level. The objective of the Battery Hub is to accelerate the development of more sustainable and higher-performance batteries, thanks to the complementary expertise of each partner and to the state-of-the-art characterisation capabilities of the ESRF. The work is currently focused on all-solid-state and Na-ion batteries until 2027. Several findings from the last year are already published or about to be. An extract of some of them will be presented after a description of the Battery Hub history and concept.

The European Battery Hub develops a comprehensive large-scale synchrotron-based correlative characterisation of battery materials and devices, integrating scattering, spectroscopic and imaging techniques into standardised workflows.

It enables the holistic understanding of reaction and degradation mechanisms in batteries.

It tackles key scientific questions for two highly relevant technologies, specifically Na-ion batte

It brings together 6 interdisciplinary academic groups from France, Germany and Sweden with ESRF ex

It pushes the frontiers of operando characterisation techniques thanks to the exceptional coherence

Primary author: Dr DANIEL, Lise (Project Manager – Batteries Characterization LITEN/DEHT CEA Grenoble, FRANCE)

Co-authors: Dr DRNEC, Jakub (ESRF, Grenoble, France); Dr LYONNARD, Sandrine (CEA and European Battery Hub)

Presenter: Dr DANIEL, Lise (Project Manager – Batteries Characterization LITEN/DEHT CEA Grenoble, FRANCE)

Session Classification: Friday Morning Plenary

Contribution ID: **91** Type: **not specified**

Networking Light Source Facilities and User Organizations Through an Online Community of Practice

Thursday, 20 November 2025 17:25 (1 hour)

Background: Synchrotron Light Sources and Social Networks
For 10+ years, the African Light Source Foundation and project (AfLS) have been capacity building in terms of human resources, global networking, and local laboratory infrastructure; all towards the realization of 4th generation synchrotron light source on the African continent.

We are building networks, identifying partners, organizing training, mobility, workshops, schools and conferences, and optimizing the use of existing funding instruments. We make and build upon strong foundations, including a massive campaign for a strong researcher user base, and a well-informed policy-maker cohort, not only across Africa but globally linked, and we audit the progress in terms of science and capacity.

For several reasons, synchrotrons offer a good opportunity to understand international professional networks of personnel, ideas, and resources . First, all synchrotrons, even where they are nationally owned facilities, host researchers of different nationalities. The staff responsible for the maintenance and development of a particular synchrotron are almost always citizens of diverse nationalities. In synchrotrons for their experiments form specific and closely interacting international scientific communities. [[More]]

So, it follows that that a major objective of aspiring synchrotron light source facilities should be to organize themselves into a common networked community, and to plug itself into to the community of existing facilities and users. Professional social networking follows from the seminal work of Granovetter who argued in 1973 that weak ties are particularly helpful in delivering new opportunities because they introduce novel information to a broader social network.

While Granovetter's original analysis mainly focused on the labor market and employment, the same principles, in the main, hold true for diffusion of technical information and tacit knowledge as well as for efficacy and productivity of team science. The central theory of the approach of this project is 'embeddedness', the core concept of economic sociology.

Organization Framework of the African Light Source Online Community of Practice
The objective is to create an online community of practice for the African Light Source that includes our Partner Organizations, e.g., disciplinary professional societies, facility users organizations, and participating synchrotron facilities.

The OCOP features include engagement features like extended profiles including bibliography listing, the ability to make connections by 'friending' and/or 'liking' individuals, partners, and content; private messaging, forums and groups, individual and group blogs, document libraries, knowledge-base wikis, collaboration space, and online courses.

The site can be responsive to multiple domain names with a customized landing page for each, e.g.,

`https://sayansi.africanlightsource.org`

`https://community.caribbeanlightsource.org`

`https://africanmineralogy.org`

`https://synchrotron.africanmaterialsresearchsociety.org`

The intent is to offer NGOs, facility users organizations, facilities themselves, et al, a branded portal where their respective members and employees can network with colleagues across academic disciplines and research organizations. Light source facilities can have a presence on the site, down to a per beam line basis.

`https://lightsourceusers.org/partners/`

Thus, the site will facilitate a global network of light source users.

As the website use progresses, a possible outcome is development of an International Union of Synchrotron Light Source Users that could apply for ISC membership.

Primary author: NORRIS, Lawrence (National Society of Black Physicists)

Presenter: NORRIS, Lawrence (National Society of Black Physicists)

Session Classification: Networking Light Source Facilities and User Organizations Through an Online Community of Practice