

## Curriculum Vitae

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**Date of CV:** October 12, 2024

### Actual status

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- **May 2024 - Present** Postdoctoral Researcher, Brookhaven National Laboratory, Upton, NY USA  
Project summary: ATLAS Experiment and African School of Physics
- **Sep. 2024 - Present** Member of the Governing Council (GC) of the Arab Physical Society (ArPS)  
What is ArPS?: ArPS is a Non-Governmental and Non-Profit Organization that aims to spread and promote physics knowledge and its advancement, improve scientific education, research and human capacity building in the Arab world. Arab world includes all countries having Arabic as an official language. ArSP fosters diversity to ensure that everyone has the same opportunities, regardless of gender, ethnicity, religion and culture.
- **Mar. 2023 - Present** Editor of the African Physics Newsletter (APN), American Physical Society  
What is APN?: APN is a quarterly electronic publication that covers physics in Africa, compiled and reported by an Editorial Board of African physicists from various regions of the continent. APS has published the newsletter since its launch in 2019.
- **Apr. 2020 - Present** Co-convener of the Young Physicists Forum (YPF) at the African Strategy for Fundamental and Applied Physics (ASFAP)  
What is ASFAP— YPF?: ASFAP— YPF facilitates engagement and networking of African students, postdocs, and anyone up to  $\sim 10$  years past their highest degree in the ASFAP Process.

### Education

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- **2014-2019** Ph.D. in Physics and Nuclear Instrumentation, Science Team of Matter and Radiation (ESMaR), Physics Department, Faculty of Sciences, Mohammed V University Rabat, Morocco  
*Title:* **Neutron Signals Nonnegative Tensor Blind Source Separation: Application to Neutron/Gamma Discrimination**  
*Supervisor:* **Prof. Rajaa Cherkaoui El Moursli & Dr. El-Mehdi Hamzaoui**
- **2011-2013** Specialized Master's Degree: Security of Computer Networks and Embedded Systems (Sécu.RISE), Design and Systems Laboratory, Physics Department, Faculty of Sciences, Mohammed V University Rabat, Morocco  
*Title:* **Development of Wavelet Based Tools for Processing and Characterising the  $\gamma$ -ray Spectrometry**  
*Supervisor:* **Prof. Mohamed Jedra & Dr. El-Mehdi Hamzaoui**
- **2008-2011** Bachelor's Degree in Fundamental Physics, Physics Department, Faculty of Sciences, Mohammed V University Rabat, Morocco  
*Title:* **Ionizing Radiation and Radioprotection**  
*Supervisor:* **Prof. Rajaa Cherkaoui El Moursli**

## Teaching and related activities

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- **Jul. 7-21, 2024** Tutorial on Events Generation & Detector Simulation using Geant4— a simulation toolkit, The 8<sup>th</sup> Biennial African School of Physics (ASP2024), Cadi Ayyad University, Marrakesh, Morocco
- **Nov 28- Dec 9, 2022** Tutorial on Events Generation & Detector Simulation using Geant4— a simulation toolkit, The 7<sup>th</sup> Biennial African School of Physics (ASP2022), Nelson Mandela University (NMU), Port Elizabeth, South Africa
- **2015-2016** Temporary teacher of Practical work: Bachelor in Physical Sciences, Nuclear Physics Module at Department of Physics, Faculty of Sciences, Mohammed V University Rabat, Morocco

## Scientific and societal contributions

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### Organisation of conferences, workshops ...

- The 8th Biennial African School of Fundamental Physics and Applications, ASP2024 July 7-21, 2024, at Cadi Ayyad University, Marrakesh, Morocco  
Co-organizer
- The 3rd African Conference on Fundamental and Applied Physics, ACP2023 September 25-29, 2023, at Nelson Mandela University, George Campus, South Africa  
Co-organizer
- ASFAP: YPF Physics Working Group Introductions Series June 8, 15, 22, 19 2022, Virtual event  
Co-organizer
- ASFAP: Young African Physicists' Workshop—Challenges and opportunities January 26, 2022, Virtual event  
Co-organizer

### Science outreach

- **Early Career Panel Discussion— "Beauty of Physics"**  
September 25, 2023, at Nelson Mandela University, George Campus, South Africa
- **Early Career African Physicists: "ASK An ASP (Alumni)"**  
September 29, 2023, at Nelson Mandela University, George Campus, South Africa

## Previous work experience

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- **Jun. 2022 - May 2023** Postdoctoral Researcher, Helsinki Institute of Physics, University of Helsinki, Finland

Activity name: **POSEIDON - Position-sensitive detectors for nuclear fuel imaging**  
Project summary: A feasibility study of a passive gamma emission tomography (PGET) device that makes use of state-of-the-art 3D position-sensitive semiconductor gamma-ray detectors will be performed. During the first year, a Monte Carlo simulation framework was set up and validated in measurements in Helsinki and Uppsala. After a 3-year activity, the benefit of 3D position-sensitive detectors for PGET applications such as the imaging of spent fuel, fuel irradiated in the context of the development of new reactor designs, fuel pin containers and nuclear waste will be established.

- **Dec. 2019 - May 2022** Member of Nexus Ubuntu Reactors- Modelling Nuclear Reactors with Geant4, University of Johannesburg (UJ), South Africa

Activity name: **Ubuntu Reactors: Geant4 modelling for Nuclear Energy**  
 Project summary: The accurate modeling of nuclear reactors is essential for design, regulation, safety analysis, operations and forensic analysis. Geant4 as a framework for general computer simulation of particle tracking in complex environments and materials.

## Reresrch Activities

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### **ATLAS ITk strips Phase II tracker upgrade** May 2024 - Present

- Working on various tasks related to the ATLAS Phase II tracker upgrade, focusing on the strips barrel at Brookhaven National Laboratory.
- Developing interlock systems to ensure safe thermal cycling of silicon strip modules, enhancing operational safety and reliability.
- Involved in quality control (QC) for the ITk strips barrel modules, utilizing a coldjig setup for temperature control, data acquisition (DAQ), and hardware monitoring.
- Serving as US contact of the coldjig software.

### **POSEIDON - Position-sensitive detectors for nuclear fuel imaging** Jun 2022 - May 2024

- Studied the performance of a Passive Gamma Emission Tomography (PGET) device utilizing state-of-the-art 3D position-sensitive semiconductor gamma-ray detectors.
- Developed a Monte Carlo simulation framework using the Geant4 toolkit to simulate detector performance, validated through code-to-code verification and experimental data from the Helsinki Institute of Physics (HIP)/University of Helsinki and Uppsala University.
- Explored the potential of Compton imaging to trace the origin of gamma rays along spent nuclear fuel assemblies (SFAs), enhancing the precision of nuclear fuel imaging.

### **Evaluation of Position-Sensitive Virtual Frisch-Grid CZT Detectors** Jun 2023 - Dec 2023

- Fabricated and tested pixelated CZT detectors for gamma-ray detection.
- Investigated the use of CZT and germanium detectors for position-sensitive gamma-ray detection, contributing to advancements in 3D imaging technologies.
- Employed two-site event reconstruction to demonstrate the array's Compton imaging capability.

### **Liquid Argon Field Calibration System (LArFCS)** Oct - Dec 2019

- Developed a dedicated system to calibrate the field response functions for the wire-readout-based single-phase Liquid Argon Time Projection Chamber (LArTPC), enhancing TPC signal processing for automated event reconstruction.
- The project contributed to the MicroBooNE data analysis and provided critical inputs for protoDUNE and DUNE experiments.
- Constructed a LabVIEW-based DAQ program for LArFCS using commercial VME modules from CAEN, avoiding the complexity of the existing MicroBooNE NEVIS FPGA readout system.

### **Ubuntu Reactors: Geant4 modelling for Nuclear Energy** Jul - Oct 2019

- Developed a stochastic Monte Carlo (MC) simulation of a High Temperature Gas Cooled Reactor (HTGCR) using the Geant4 framework.

- Implemented basic neutronics, geometrical discretization, time slicing, and intra-slice persistence for studying spatial variations of physical parameters.
- Integrated thermal hydraulics via workflow scheduling and validated thermal macroscopic cross-section behavior, fission, burn, decay, and differential energy deposition processes.
- Conducted validation of Xenon effects on neutronics, criticality, and core behavior over multiple time steps.

**Ph.D. Research: Software  $n/\gamma$  Discrimination Using Nonnegative Tensor Factorization (NTF) Algorithms** Nov 2014 - Apr 2019

- Applied Nonnegative Tensor Factorization (NTF) algorithms to extract independent components from signals recorded at the fission chamber preamplifier’s output, achieving software-based  $n/\gamma$  discrimination.
- Simulated neutron flux in the TRIGA Mark II reactor using Monte Carlo methods with Geant4 and Garfield++ to model the fission process, energy deposition, and ionization in the fission chamber.
- Integrated Magboltz and Heed within Garfield++ for analysis of electron-ion drift lines and induced signals, providing a detailed simulation of stochastic events and detector response.
- Processed output signals using the NTFLab toolbox in MATLAB®; identified NTF1 and NTF2 as the most effective algorithms for data analysis, achieving separation of neutron and  $\gamma$ -ray signals.
- Demonstrated successful  $n/\gamma$  discrimination without prior knowledge of signal mixture, validated by analyzing signal-to-noise ratio (SNR) and normalized correlation functions between pure neutron and  $\gamma$ -ray signals.

## Publications

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1. S. Saariokari et al. *Nuclear fuel imaging using position-sensitive detectors.*, arxiv, 2024, [<https://arxiv.org/abs/2409.20214>]
2. A. E. Bolotnikov et al. *3x3 array module of 8x8x32 mm<sup>3</sup> position-sensitive virtual Frisch-grid CdZnTe detectors for imaging and spectroscopy of cosmic gamma-rays.*, NIMA, 2024, [[NIMA, 10.1016/j.nima.2024.169328](#)]
3. K. A. Assamagan et al. *Summary Report on the 2024 African School of Physics Program for Learners.*, arxiv, 2024, [[arxiv, https://doi.org/10.48550/arXiv.2408.01464](#)]
4. V. Rathor et al. *First experimental demonstration of the use of a novel planar segmented HPGe detector for gamma emission tomography of mockup fuel rods.*, Nuclear Technology, 2023, [[Nuclear Technology, doi.org/10.1080/00295450.2023.2236882](#)]
5. P. Dendooven et al. *Passive methods for spent fuel characterisation at the Finnish geological repository.*, Italian Physical Society, [[10.1393/ncc/i2023-23047-4](#)]
6. B. Mulilo M. Laassiri and D. Boye *Young Physicists Forum and the Importance for Education and Capacity Development for Africa*, physics.soc-ph, [[arXiv:2206.15171](#)]
7. M. Laassiri et al. *ASFAP Working Group Summary of Societal Engagements*, arXiv:2205.11362 [physics.soc-ph], ([arXiv:2205.11362](#))
8. K.A Assamagan et al. *Activity Report of the Second African Conference on Fundamental and Applied Physics, ACP2021*, physics.ed-ph, [[arXiv:2204.01882](#)]

9. A.C. Cilliers, S.H. Connell, J. Conradie, M.N.H. Cook, M. laassiri, B.G. Maqabuka, R. Mudau, P. Naidoo and D. Nicholls *Towards a Monte Carlo simulation of a pebble bed type high temperature gas cooled reactor using Geant4*, Annals of Nuclear Energy (2021),[[ANE-108868](#)]
10. K.A Assamagan, B. Acharya, T. Adenuga, K. Cecire, A. E. Dabrowski, C. Darve, J. R. Ellis, F. Ferroni, M. Laassiri and S. G. Muanza, *The African School of Fundamental Physics and Applications Activity Report 2019-2021*, physics.ed-ph, [[arXiv:2109.00509](#)]
11. K.A Assamagan and M. laassiri, *The African School of Fundamental Physics and Applications (ASP)*, physics.ed-ph, [[arXiv:1909.06309](#)]
12. M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Validation of the neutron and gamma fields in the Moroccan TRIGA Mark II reactor using Nonnegative Tensor Factorization approach: Comparison of performances of the Geant4/Garfield++ and pyFC interfaces*, Acta Phys. Pol. B Proc. Suppl., vol. 11 (2018), p. 73, [[APhysPolBSupp.11.73](#)]
13. M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Nonnegative Tensor Factorization Approach Applied to Fission Chamber's Output Signals Blind Source Separation*, J. Phys. Conf. Ser., vol. 966 (2018), p. 012063, [[IOP Conf. Series: Journal of Physics](#)]
14. M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Application of Nonnegative Tensor Factorization for neutron-gamma discrimination of Monte Carlo simulated fission chamber's output signals*, Results Phys., vol. 7 (2017), p. 1422-1426, [[rinp-2017](#)]

## Seminars and Colloquia

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- M. laassiri et al., *3x3 array module of 8x8x32 mm<sup>3</sup> position-sensitive virtual Frisch-grid CdZnTe detectors for imaging and spectroscopy of cosmic gamma-rays*, BNL, Instrumentation Division Seminar, March 19, 2024
- M. laassiri et al., *Monte Carlo study of a 3D Position-Sensitive Semiconductor gamma-ray Detectors for Nuclear Fuel Imaging*, University of Illinois Urbana-Champaign Champaign, Department of Nuclear, Plasma, and Radiological Engineering Seminar, July 27, 2023
- M. laassiri et al., *Monte Carlo study of a 3D Position-Sensitive Semiconductor gamma-ray Detectors for Nuclear Fuel Imaging*, BNL, Instrumentation Division Seminar, March 22, 2023
- M. laassiri et al., *Monte Carlo (MC) modelling of a nuclear reactor core using the Geant4 framework*, Nuclear Reactors Seminar, Brookhaven National Laboratory (BNL), Nuclear Science and Technology Department, Bldg. 817, December 18, 2019

## Contribution to conferences, schools, and workshops

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### 1. Oral Communications

- M. laassiri et al., *The African School of Fundamental Physics and Applications (ASP)*, EuPRAXIA\_PP Annual Meeting 2024, Elba, Italy, September 27, 2024
- M. laassiri et al., *Performance of 8x8x32 mm<sup>3</sup> position-sensitive CdZnTe detector array for nuclear imaging*, The National Society of Black Physicists Conference (NSBP2023), Knoxville, Tennessee, November 10, 2023
- M. laassiri et al., *3D Position-Sensitive Semiconductor Detectors for Nuclear Fuel Imaging*, The 3rd African Conference on Fundamental and Applied Physics (ACP2023), Nelson Mandela University, George Campus, South Africa, September 27, 2023

- M. laassiri et al., *An overview of the African School of Physics*, The 3rd African Conference on Fundamental and Applied Physics (ACP2023), Nelson Mandela University, George Campus, South Africa, September 27, 2023
- M. laassiri et al., *The African School of Fundamental Physics and Applications (ASP)*, Workshop on Exploring Collaboration with MSIs in Nuclear and Particle Physics, *Invited Speaker*, Brookhaven National Laboratory, Upton, New York, July 19, 2023
- M. laassiri, *Young African in Nuclear Physics*, WDTS-RENEW BNL/Fermi Lab Exchange Summer School, *Invited Speaker*, Brookhaven National Laboratory, Upton, New York, July 21, 2023
- M. laassiri et al., *Young African in Nuclear Physics*, APS Virtual March Meeting 2023, *Invited Speaker*, Open SESAME: Waves of Success and Recognition Connecting Women Scientists Beyond Skepticism-Beyond Borders, March 21, 2023
- M. laassiri et al., *The Perspectives of the Young Physicists Forum of the African Strategy for Fundamental and Applied Physics (ASFAP)*, APS March Meeting 2023, *Invited Speaker*, Session Q50: International Perspective for Young Physicists from Particle to Materials, March 8, 2023
- M. laassiri et al., *Monte Carlo study of a 3D Position-Sensitive Semiconductor gamma-ray Detectors for Nuclear Fuel Imaging*, Seminar at the Uppsala University, January 20, 2023
- M. laassiri et al., *The African School of Physics and its initiatives and programmes*, The 7<sup>th</sup> edition of the biennial African School of Fundamental Physics and Applications (ASP2022), Nov 28- Dec 9, 2022
- M. laassiri et al., *ASFAP Working Group Summary of Societal Engagements*, The second African Conference of Fundamental and Applied Physics (ACP2021), March 11, 2022
- M. laassiri et al., *Ubuntu reactors– Modelling Nuclear Reactors w/ Geant4*, The second African Conference of Fundamental and Applied Physics (ACP2021), March 07, 2022
- M. laassiri et al., *Pan-African Physics Roadmap Definition— Societal Engagements*, Joint Conference: African Light Source, Pan African Conference on Crystallography, and African Physical Society, November 16, 2021
- M. laassiri et al., *African Young Physicists Forum*, The 6<sup>th</sup> Biennial African School of Physics (ASP), July 23, 2021
- M. laassiri et al., *ASP Online Seminars: Neutron/Gamma Identifications in Nuclear Reactors*, Online lecture, April 27, 2021
- M. laassiri et al., *Neutron Signals Nonnegative Tensor Blind Source Separation: Application to neutron/gamma discrimination*, NSBP2019, The National Society of Black Physicists Conference, Providence, Rhode Island November 16, 2019
- M. laassiri et al., *The African School of Fundamental Physics and Applications (ASP)*, DPF2019, The American Physical Society Division of Particles & Fields (DPF) Meeting, Boston, July 30, 2019
- M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Application of Nonnegative Tensor Factorization Algorithm for Neutron-Gamma Discrimination*, NPW2017, The XXIV Nuclear Physics Workshop, Kazimierz Dolny, September 21, 2017
- M. laassiri & al., *Emergency planning and response*, Joint ICTP-IAEA School on Nuclear Energy Management (NEM), the Abdus Salam International Center for Theoretical Physics (ICTP) Trieste, Italy, November 13, 2015

## 2. Poster Communications

- P. Dendooven et al., *Position-sensitive semiconductor detectors for nuclear fuel imaging*, iWoRiD2023 "24th International Workshop On Radiation Imaging Detectors" at Oslo Science Park, June 25-29, 2023

- M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Fission Chamber's Identification and Characterization Using Nonnegative Tensor Factorization Algorithms*, EFMMIN5 "The fifth edition of the Franco-Moroccan School of Measurement and Instrumentation Nuclear" at Mohammed V University-2018, October 9, 2018
- M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Neutron-Gamma Discrimination Based on Nonnegative Tensor Factorization Methods*, Spring2017, The 12th International Spring Seminar on Nuclear Physics "Current Problems and Prospects for Nuclear Structure" at Ischia, Italy-2017, May 18, 2017
- H. Arahmane, M. laassiri, A Mekaoui, E-M. Hamzaoui and R. Cherkaoui El Moursli, *Neutron-gamma discrimination using non-negative matrix factorization blind sources separation algorithms* ND2016, "International Conference on Nuclear Data and Technology Bruges" at Bruges Belgium-2016, September 13, 2016
- M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *A Monte Carlo simulation of the fission chamber neutron-gamma discrimination using the NTF* ASP2016, "African School of Physics" at the University of Rwanda-2016, August 18, 2016
- M. laassiri, E-M. Hamzaoui and R. Cherkaoui El Moursli, *A Preliminary Study on Fission Chamber Simulation for Neutron Gamma Discrimination using Geant4 and NTF*, EFMMIN4 "The fourth edition of the Franco-Moroccan School of Measurement and Instrumentation Nuclear" at Aix Marseille University-2016, July 20, 2016

## Computer skills

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- **Computer Skills** L<sup>A</sup>T<sub>E</sub>X, Office Suite
- **Programming Language** C/C ++, Java/JEE, Mathematica, Maple, Matlab, Python XML
- **Software** LabVIEW
- **OS** Windows (XP, 200X, Vista, 10), Linux (Ubuntu, Debian, Scientific linux )
- **Particle Transport Simulation** Geant4, Garfield++, MCNP5
- **Data Analysis** ROOT, Matlab, IDL
- **Blind Source Separation Algorithms** ICALab, NMFLab, NTFLab

## Language skills

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| • <b>Arabic</b> Excellent (Mother Tongue) | • <b>English</b> Good level |
| • <b>French</b> Excellent                 | • <b>Finnish</b> fair       |