Curriculum Vitae

Felix O. Saouma, PhD

Physics Lecturer and Chair
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RESEARCH INTERESTS

Dr. Felix O. Saouma is highly skilled in the **nonlinear optical characterization of semiconductor materials**, with expertise in the use of **tunable laser systems** and **optical spectroscopic techniques**. He has actively contributed to **cutting-edge research** in the field, particularly in the **characterization of nonlinear optical properties** of novel and emerging materials.

Dr. Saouma's current research integrates **experimental techniques** with **computational modeling**, with a focus on the **application of Density Functional Theory (DFT)** to investigate the **electronic structure**, **optical responses**, and **functional behavior** of advanced materials. His work lies at the intersection of computational physics, materials science, and photonics, and aims to accelerate the development of next-generation materials for **renewable energy** and **optoelectronic technologies**.

Key Research Interests:

- **Computational Study of Electronic Structure**
  Applying DFT to predict and analyze the electronic, optical, and structural properties of novel materials.
- **Nonlinear Optical Materials**
  Investigating the nonlinear optical responses of perovskite solar cell materials,

chalcogenides, and multiferroic compounds, especially in the mid-infrared (IR) frequency range.

- **Photovoltaic Materials**
  Design and optimization of high-performance materials for solar energy conversion, with emphasis on efficiency, stability, and sustainability.
- **Thermoelectric Materials**
  Exploration of materials capable of converting heat into electricity, contributing to efficient energy harvesting systems.
- **Materials Science**
  Broad interests in structure–property relationships, defect engineering, and the development of functional materials for energy and electronic applications.

Dr. Saouma's research advances the understanding of material behavior at the atomic level, with implications for **sustainable technologies**, **optical communication systems**, and **emerging energy solutions**.

EDUCATIONAL BACKGROUND

Dr. Felix O. Saouma is a **Lecturer, Researcher, and Chair** of the Department of Physical Sciences within the **School of Science (SoSci)** at **Kaimosi Friends University (KAFU)**. He earned his **PhD in Physics** from the **State University of New York (SUNY) at Binghamton** in 2017, where his doctoral research focused on the *"Nonlinear Optical Properties of Emerging Perovskite Solar Cell Materials."* He holds a **Bachelor of Education in Science (Mathematics and Physics)** from **Kenyatta University (KU)**, awarded in 2008.

PEER REVIEWED JOURNALS

[1] "Computational study of LiAlSi, LiAlGe and LiGaSi Half-Heusler alloys for opto-electronic applications", Madallah Yusuf, George S. Manyali, **Felix O. Saouma**, Physica B: Condensed Matter 693 416390 (2024).

[2] "First principles study of thermos-physical and opto-electronic properties of NaCuTe, NaCuSe and NaScSn as potential photovoltaics", Madallah Yusuf, **Felix O. Saouma**, George S. Manyali, Job W. Wafula, Anthony Pembere, Physica B: Condensed Matter **684** 415954 (2024).

[3] "DFT investigation of structural, elastic, electronic, thermodynamic and optical properties of KCuZ (Z= Te, Se) solar absorbers", Madallah Yusuf, **Felix O. Saouma**, George S. Manyali, Job W. Wafula, Odanga Huxley, Solid State Communications. 370, 115219 (2023).

[4] ''Low Born effective charges, high covalency and strong optical activity in $X_3^{2+}Bi^{3-}N^{3-}$ ($X = Ca, Sr, Ba$) *inverse*-perovskites", Jasmine Wakini, Carolyne Songa, Stephen Chege, **Felix O. Saouma**, Elica Wabululu, P.W.O Nyawere, Victor Odari, James Sifuna, George S. Manyali, https://arxiv.org/abs/2203.00359 [cond-mat.mtrl-sci].

[5] ''*Synthesis, structure, linear and nonlinear optical properties of noncentrosymmetric quaternary diamond-like semiconductors, $Cu_2ZnGeSe_4$ (CZGSe) and the novel $Cu_4ZnGe_2Se_7$*'', Charles W. Sinagra III, **Felix O. Saouma**, Calford O. Otieno, Saul H. Lapidus, Jian-Han Zhang, Andrew J. Craig, Pedro Grima-Gallardo, Jacilynn A. Brant, Kimberly A. Rosmus, Kate E. Rosello, Joon I. Jang, Jennifer A. Aitken, Journal of Alloys and Compounds. 888, 161499 (2021).

[6] "*Crystal structure and second harmonic generation in Bi_2TeO_5: An X-N study from synchrotron and neutron diffraction data*", C. A. Lopez, E. Baati, M. T. Fernandez-Diaz, **F. O. Saouma**, J. I. Jang, J. A. Alonso, , J. Solid State Chem. 276, 122 (2019).

[7] "*Phase transitions of formamidinium lead iodide perovskite under pressure*", S. Jiang, Y. Luan, J. I. Jang, T. Baikie, X. Huang, R. Li, **F. O. Saouma**, Z. Wang, T. J. White, and J. Fang, J. Am. Chem. Soc. 140, 13952 (2018).

[8] "*Structural and spectroscopic properties of the polar antiferromagnet Ni_2MnTeO_6*", M. Retuerto, S. Skiadopouou, F. Borodavka, C. Kadlec, F. Kadlec, J. Prokleska, Z. Deng, J. A. Alonso, M. T. Fernandez-Diaz, **F. O. Saouma**, J. I. Jang, D. Legut, S. Kamba, and M. Greenblatt, Phys. Rev. B. 97, 144418 (2018).

[9] "*Selective enhancement of optical nonlinearity in two-dimensional organic-inorganic lead iodide perovskites*", **F. O. Saouma**, C. C. Stoumpos, J. Wong, M. G. Kanatzidis, and J. I. Jang, Nat. Com. **8**, 742 (2017).

[10] "*Multiphoton absorption order of $CsPbBr_3$ as determined by wavelength-dependent nonlinear optical spectroscopy*", **F. O. Saouma**, C. C. Stoumpos, M. G. Kanatzidis, Y. S. Kim, and J. I. Jang, J. Phys. Chem. Lett. **8**, 4912 (2017).

[11] "*Multiphoton absorption coefficients of organic-inorganic lead halide perovskites $CH_3NH_3X_3$* (X = Cl, Br, I)", **F. O. Saouma**, D. Park, S. H. Kim, M. S. Jeong, and J. I. Jang, Chem. Mater. **29**, 6876 (2017).

[12] "*Polarization-selective three-photon absorption and subsequent photoluminescence in $CsPbBr_3$ single crystal at room temperature*", D.J. Clark, C. C. Stoumpos, **F. O. Saouma**, M. G. Kanatzidis, and J.I. Jang, Phys. Rev. B. 93, 195202 (2016).

[13] "*Phase transition, conformational exchange, and nonlinear optical third harmonic generation of the* $[P_2Se_8]^{2-}$ *anion*", A. S. Haynes, A. Bannergee, **F. O. Saouma**, C. O. Otieno, J.I. Jang, and M. G. Kanatzidis, Chem. Mater. **28**, 2374 (2016).

[14] "*Low-temperature cationic rearrangement in a bulk metal oxide*", M.-R. Li, M. Retuerto, P.W. Stephens, M.C. Croft, S. Baidya, T. Saha-Dasgupta, D. Sheptyakov, V. Pomjakushin, Z. Deng, H. Akamatsu, V. Gopalan, J. Sanchez-Benitez, **F. O. Saouma**, J.I. Jang, D. Walker, and M. Greenblatt, Angew. Chem. Int. Ed. **55,** 9862 (2016)

[15] "*Phase-change behavior and nonlinear optical second and third harmonic generation of the one-dimensional* $K_{1-x}Cs_xPSe_6$ *and metastable beta-*$CsPSe_6$", A. S. Haynes, **F. O. Saouma**, C. O. Otieno, D.J. Clark, D. P. Shoemaker, J.I. Jang, and M. G. Kanatzidis, Chem. Mater. **27**, 1837 (2015).

[16] "Mn_2FeWO_6 *a new* Ni_3TeO_6*-type polar and magnetic oxide*", M.-R. Li, M.C. Croft, P.W. Stephens, M. Ye, D. Vanderbilt, M. Retuerto, Z. Deng, C. P. Grams, J. Hemberger, J. Hadermann, W.-M. Li, C.-Q. Jin**, F. O. Saouma**, J.I. Jang, H. Akamatsu, V. Gopalan, D. Walker and M. Greenblatt, Adv. Mater. **27**, 2177 (2015).

[17] "*Evidence from room temperature electric polarization in* RMn_2O_5 *multiferroic*", V. Baledent, S. Chattopadhyay, P. Ferty, M.B. Lepetit, M. Greenblatt, B. Wanklyn, **F. O. Saouma**, J.I. Jang, and P. Foury-Leylekian, Phys. Rev. Lett. **114**, 117601 (2015).

[18] "*Semiconducting properties and phase-matching nonlinear optical response of the one-dimensional selenophosphates* ANb_2PSe_{10} *(A=K, Rb, and Cs)*", J. C. Syrigos, D. J. Clark, **F. O. Saouma**, S. M. Clarke, L. Fang, J. I. Jang, and M. G. Kanatzidis, Chem. Mater. **27**, 255 (2015).

[19] "*Magnetic-structure-stabilized polarization in an above-room-temperature ferrimagnet*", M.-R. Li, M. Retuerto, D. walker, T. Sarkar, P.W. Stephens, S. Mukherjee, T.S. Dasgupta, J. P. Hodges, M.C. Croft, C. P. Grams, J. Hemberger, J. Sanchez-Benitez, A. Huq, **F.O. Saouma**, J. I. Jang, and M. Greenblatt, Angew. Chem. Int. ED. **53**. 10774 (2014).

[20] "*Impact of two-photon absorption on second harmonic generation in CdTe as probed by wavelength-dependent Z-scan nonlinear spectroscopy*", J. I. Jang, S. Park, D.J. Clark, **F. O. Saouma**, D. Lombardi, C. M. Harrison, and B. Shim, J. Opt. Soc. Am. **30**, 2292 (2013).

[21] "*Broadband studies of the strong mid-infrared nonlinear optical responses of* $KPSe_6$", J. I. Jang, A. S. Haynes, **F. O. Saouma**, C. O. Otieno, and M. G. Kanatzidis, Opt. Mater. Express **3**, 1302 (2013) - **Special Issue: Mid-IR photonic materials**

CONFERENCE PAPERS

[1] "*The effect of grain improvement on carrier lifetime in perovskite solar devices*", D. Fisher, **F. O. Saouma**, J. I. Jang, T. P. Dhakal, Photovoltaic Specialists Conference (PVSC), 2016 IEEE 43rd, 0768-0772.

INTERNATIONAL WORKSHOPS

[1] "*5th African School on Electronic Structure Methods and Applications (ASESMA-2018)*" 22 October – 2 November 2018, Addis Ababa Science & Technology University (AASTU), Addis Ababa-Ethiopia. Role: Participant. http://indico.ictp.it/event/8354/

[2] "*Regional-African School on Electronic Structure Methods and Applications (RASESMA) with ABINIT*" 27-31 January, 2020, University of Rwanda, Kigali, Rwanda. Role: Participant. https://eaifr.ictp.it/events/rasesma-2020/

[3] ''U.S.–Africa Initiative in Electronic Structure (USAfrI) workshop'' held 14-18 June, 2021 held virtually and hosted by the ICTP-EAIFR, University of Rwanda, Kigali, Rwanda. https://usafricainitiative.org/JuneWorkshop2021/

[4] ''East African Summer School on Optics and Lasers" 6-17 May, 2024, Multimedia University of Kenya, Nairobi, Kenya. https://indico.ictp.it/event/10472#:

LOCAL WORKSHOPS

Laboratory Equipment Grant Proposal Writing, Tom Mboya Labour College, Kisumu-Kenya. Role: Participant.

Computational and Theoretical Physics Annual Workshop (CTheP) held in June 2019 courtesy of Masinde Muliro University of Science and Technology.

INTERNATIONAL CONFERENCES

[1]"*Enhancing nonlinear optical response by optimizing the structure of noncentrosymmetric chalcogenides*", A. S. Haynes, C. O. Otieno, **F. O. Saouma**, L. Frazer, J. B. Ketterson, J. I. Jang, and M. G. Kanatzidis, Presented at the 246th ACS National Meeting, Indianapolis, Indiana, September 8-12, (2013) INOR-506.

[2] "*1D selenophosphates and their nonlinear optical properties*", A. S. Haynes, C. O. Otieno, **F. O. Saouma**, J. I. Jang, and M. G. Kanatzidis, Presented at the 248th ACS National Meeting, San Francisco, California, August 10-14, (2014) INOR-566.

[3] "*Nonlinear optical second and third harmonic generation of the one-dimensional* $K_{1-x}Cs_xPSe_6$ and metastable β $-CsPSe_6$ ", A. S. Haynes, **F. O. Saouma**, C. O. Otieno, D. J. Clark, J. I. Jang, and

M. G. Kanatzidis, Presented at the North American Solid State Chemistry Conference, Tallahassee, Florida, May 22-24, (2015).

[4]"*The effect of grain boundaries on carrier lifetime in perovskite solar devices*", D. Fisher, **F. O. Saouma**, J. I. Jang, and Tara P. Dhakal, Photovoltaic Specialists Conference (PVSC), Portland, Oregon (2016).

[5] "*New polar and magnetic corundum-type oxides, $A_2BB'O_6$ high pressure synthesis*", Martha Greenblatt, Manrong Li, Maria Retuerto, Zheng Deng, Mark Croft, David Vanderbilt, Meng Ye, Peter Stephens, Joke Hadermann, David Walker, Joachim Hemberger, Christoph Grams, Chang-Qing Jin, Wen-Min Li, Joon Jang, **Felix O. Saouma**, Venkatraman Gopalan, and Hirofumi Akamatsu, Presented at the 250th ACS National Meeting, Boston, August 16-20, (2015).

INVITED COLLOQUIUM

"Broadband nonlinear optical properties of $K_{1-x}Cs_xPSe_6$ $(0 \leq x < 1)$" Chemistry colloquium, State University of New York at Binghamton, New York (2014).

Nonlinear optical processes & materials and their corresponding applications" Department of Physics colloquium, Multimedia University of Kenya (MMU), Nairobi-Kenya (2017).

GRANTS, HONORS AND AWARDS

- **KES 1500000** awarded for "Study of photovoltaic absorbers and thermoelectric materials using density functional theory", George Manyali, Celine Omondi, **Felix O. Saouma**, Victor Odari, Kenya Education Network (KENET) through the Computational Modeling and Materials Science (CMMS) research grant.
- **$3100** awarded by K. Keith Innes Summer Research Grant, **May 2014**. State University of New York at Binghamton.
- Graduate Assistant/Teaching Assistant (GA/TA) Fellowship **(2011-2017).** State University of New York at Binghamton.

MEMBER OF PROFESSIONAL BODY

- Member of American Physical Society.

POSTGRADUATE SUPERVISION TO COMPLETION

1. Master of Science thesis entitled "First Principles Study of the Bulk Properties of KCuTe and NaCuTe as potential Solar Absorber" by Madallah Yusuf Kaunda Department of Physical Sciences-Kaimosi Friends University (2024).

EXTERNAL EXAMINER FOR MASTER OF SCIENCE THESIS

1. Appointed external examiner at the University of Eldoret, School of Science - Department of Physics to examine Master of Science thesis entitled "The correlation between Nucleon-Nucleon interaction, pairing energy gap and Phase Shift for identical Nucleons in Nuclear System".

EXTERNAL REVIEWER FOR BACHELOR OF SCIENCE WITH EDUCATION CURRICULUM

Invited to attend a stakeholders' workshop to review Bachelor of Science with Education curriculum (Focus area; Physics) organized by School of Science at the University of Eldoret.

PROFESSIONAL APPOINTMENTS

1. October 2017– April 2018: Appointment as Acting Chairperson, Department of Physical Sciences.
2. January 2019: Appointment as School Attachment Coordinator for Sabatia /Hamisi Zone.
3. April 2018 – July 2019: Appointment as Acting Dean, School of Science.
4. July 2019 – October 2019: Appointment as Acting Dean, School of Science.
5. October 2019 – Current: Appointment as Chair, Department of Physical Sciences.
6. June 2021 – Current: ISO 9001:2015: Implementers Training Course.
7. August 2021 – Current: Appointment as process owner/Implementer- KAFU Quality Management System (QMS) based on ISO: 9001: 2015 standard.
8. July 2022 – Current: Appointment as a Quality Management System ISO 9001: 2015 Internal Auditor.

PROFESSIONAL TRAININGS

1. Workshop for Kenya Institute of Curriculum Development (KICD) panel members on Global Citizenship Education. July 2019.
2. Research team capacity enhancing programme for grants proposal writing held on July 2018
3. Life Skills training at Kaimosi Friends University conducted on February and June 2018.
4. Open Distance e-Learning (ODeL) training Workshop – May 2018.
5. 2nd Research Capacity Building Seminar on Grant Proposal writing held in February 2019.
6. ISO 9001: 2015 and ISO 19011: 2018 Internal Quality Auditors Training – June 2022.

CHAIR/COMMITTEE MEMBER

1. Appointment as a member – Science, Technology and Innovation (STI) Committee – August 2022.
2. Appointment as a member to the university committee on competency based curriculum - 2022.
3. Committee to short list candidates in Estates/Physical Facilities Department- December 2021.
4. Appointment as a Chairperson – Inspection and Acceptance Ad-Hoc Committee for proposed Completion of Tuition Block and Associated Works – November 2020.
5. Appointment as a Champion for Institutional Science Technology and Innovation (STI) Mainstreaming at Kaimosi Friends University.
6. Appointment as an external examiner for Master of Science Thesis: University of Eldoret – September 2020.
7. Appointment as a member of the Ad-Hoc Committee for On-line Examinations – August 2020.
8. Appointment as member Academic Quality Assurance Committee – July 2020.
9. Chair, Ad-Hoc committee on Electrical works, Fencing & Security Lights -August 2019.
10. Appointment as a member – University Strategic Plan Review Committee – March 2019.
11. Appointment as member – Inspection and Acceptance Ad-Hoc Committee.
12. Appointment as a member – University Research Committee-May 2018
13. Appointment as a member -Project Management team for proposed removal of asbestos and re-roofing & associated works: LOT I-IV.
14. Appointment as the chairman of the Fourth Kaimosi Friends University Student Organization-January 2018.

Prepared by

Dr. F. Saouma