Stanford University Physics
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Soud Al Kharusi

Current Role

2024 **Postdoctoral Scholar in Physics**, Stanford University, Stanford, CA.
- Searching for new forces and extra-dimensions at sub-micron distances through x-ray and neutron scattering in supercritical xenon
- Detection mechanisms for extra-galactic supernova neutrinos, relic neutrinos

Education

2018–2024 **Ph.D., Physics**, McGill University, "A water-Cherenkov muon veto for the nEXO neutrinoless double beta decay experiment".
Awarded the Doctoral Thesis Prize from the Canadian Assoc. of Physicists, Particle Physics Division.
Supervisors: Thomas Brunner & Daryl Haggard

2014-18 **Bachelor of Science, Physics**, McGill University, Montréal.

Fellowships & Awards

Spring 2024 **Doctoral Thesis Prize**, Canadian Association of Physicists, Particle Physics Division.
Winter 2023 **Travel Fellowship**, Canadian Institute of Nuclear Physics (CINP), $650.
Summer 2022 **1st Place Overall Poster Prize**, Canadian Association of Physicists (CAP) Congress, $400.
Summer 2022 **2nd Place Poster Prize (Particle Physics)**, CAP Congress, $100.
Fall 2021 **1st Place Talk Prize**, SNOLAB User's Meeting.
Fall 2020 **Student Award for Contribution to Research**, McDonald Institute, $250.
Fall 2020 **Wolfe Fellowship**, McGill Department of Physics, $6,000.
2018-19 **Hydro-Quebec Fellowship**, McGill Faculty of Science, $10,000.
2018-19 **Alexander McFee Award**, McGill Department of Physics, $10,000.
Fall 2018 **Globalink Award**, MITACS, $6,000.
Visiting scholar at PNNL, Stanford University/SLAC National Accelerator Laboratory

Teaching Experience

Winter 2019 **Teaching Assistant, Experiment Methods in Physics II**, McGill University, Montréal.
- Demonstrated laboratory procedures and safety measures
- Taught experimental techniques, statistical error analysis
- Evaluated student performance

Summer 2016 **Undergraduate Assistant Lab Technician**, McGill University, Montréal.
- Redeveloped the PHYS 257/258 courses at McGill University
- Introduced new pedagogical experiments in quantum physics, produced lab manuals, purchased equipment
- Produced instructional videos for future TAs and lab technicians

Research Mentorship

Played a significant role in the following student research projects.

2024 **B. Wojin**, A particle in an expanding spherical box.
2022 **S. Majidi**, Designing a Calibration System for nEXO's Outer Detector with Chroma.
2021 **E. Klemets**, Chroma Simulations for nEXO's Outer Detector.

2021 **L. Retty**, Design and Modelling of PMTs for nEXO's Outer Detector.
2021 **R. Ross**, Underground Muon Flux Calculations for SNOLAB.
2020 **E. Klemets**, Geant4 Simulation of the Electroluminescent Light Source.
2020 **M. Bai**, GPU-accelerated Photon Propagation with Chroma for a SiPM Test Stand.
2019 **M. Cvitan**, A Motorized X-Y Stage for Photosensitive Scans.
2019 **E. Klemets**, Localization of Inverse Beta Decay in the nEXO Outer Detector.

Extracurricular Activities & Service Work

2023 **Mentor**, McGill Physics Hackathon.
2021-2023 **Diversity, Equity, and Inclusion Committee**, nEXO Collaboration.
- Co-founder of nEXO mentorship program
- Co-lead on proposal for early career board representatives

2021-2023 **Outer Detector Simulations Lead and Meeting Convener**, nEXO Collaboration.
2023 **Data Visualization Workshop Lead (invited)**, STEADY Workshop Series.
- Designed and led a data visualization workshop targeted at junior graduate students.

2022 **Judge**, McGill Physics Hackathon.
2021 **Events Director**, Highly Qualified Personnel Advisory Committee (HQP AC), McDonald Institute.
2021 **Cryo/Hardware Coordinator and Meeting Convener**, Light-only Liquid Xenon Experiment.
2021 **Technical Workshop Co-lead**, McDonald Institute, EIEIOO Summer School 2021.
2021 **Local Organizing Committee**, Winter Nuclear and Particle Physics Conference (virtual).
2020 **Scientific & Local Organizing Committee**, *Canadian Multimessenger Astrophysics Workshop*.
2017-18 **Vice-President (Internal Affairs)**, Science Undergraduate Society of McGill.
- Managed $250,000 budget to host socio-cultural events for science undergraduates
- Held a seat on the SUS General Council, drafted and passed motions affecting over 4000 undergraduates

2016-17 **President**, McGill Society of Physics Students.
- Voted departmental council of the year by the faculty of science

Skills

Software Python, C++, bash, GEANT4, ROOT, HTML/CSS
Laboratory UHV Systems, Slow Control Systems, Cryogenics, Vacuum Ultraviolet Optics
Soft Leadership, Project Organization, Event Coordination, Communication & Presentation
Languages English - fluent, Arabic - fluent

Conference Presentations

2024 **S. Al Kharusi**, "The Search for $0\nu\beta\beta$ with nEXO" (invited), SNOLAB Colloquium.
2024 **S. Al Kharusi**, "Harmonizing Muon Flux Modelling at SNOLAB" (invited), SNOLAB User's Meeting.
2024 **S. Al Kharusi**, "A Water-Cherenkov Muon Veto for nEXO" (invited), Canadian Association of Physicists Congress.
2023 **S. Al Kharusi**, "nEXO: Searching for Lepton Number Violation and Majorana Neutrinos" (invited), Canadian Association of Physicists Congress.
2023 **S. Al Kharusi**, "Public lecture: Neutrino Astrophysics" (invited), Trottier Space Institute.
2023 **S. Al Kharusi**, "The nEXO Experiment" (invited), Lake Louise Winter Institute on Fundamental Interactions.
2023 **S. Al Kharusi**, "Mitigating Cosmogenic Backgrounds in nEXO", Winter Nuclear and Particle Physics Conference.

2021 **S. Al Kharusi**, "Neutrinoless double beta decay with nEXO" (invited), McDonald Institute Annual General Meeting (virtual).

2021 **S. Al Kharusi**, "Status and Overview of the Light-only Liquid Xenon Experiment", CAP Annual Congress (virtual).

2021 **S. Al Kharusi**, "Neutrinoless double beta decay with nEXO", SNOLAB User's Meeting (virtual).

2020 **S. Al Kharusi** & L.J Kaufman, "nEXO Outer Detector and Muon Veto" (video), APS April Meeting (virtual).

2020 **S. Al Kharusi**, "Supernova Neutrino Detection with nEXO", Canadian Multimessenger Astrophysics Workshop, Montréal, QC.

2019 **S. Al Kharusi**, "Developments of nEXO's Outer Detector", CAP Annual Congress, Simon Fraser University, Vancouver, BC.

2019 **S. Al Kharusi**, "Supernova Neutrinos with nEXO", Centre for Research in Astrophysics of Quebec (CRAQ) Annual Meeting, Lac-à-l'Eau-Claire, QC.

Poster Presentations:

2022 **S. Al Kharusi**, "Using GPUs to Design a Water Cherenkov Detector for a Neutrinoless Double Beta Decay Search in nEXO" (poster), CAP Annual Congress, McMaster University, Hamilton, ON.

2020 **S. Al Kharusi**, "The nEXO Outer Detector and Muon Veto" (video pitch), Neutrino 2020 (virtual).

2019 **S. Al Kharusi**, "Supernova Neutrinos with nEXO" (poster), Canadian Astronomical Society (CASCA) Annual Meeting, McGill University.

2019 **S. Al Kharusi**, "Supernova Neutrinos with nEXO", SNEWS 2.0 Workshop, Laurentian University.

Publications

An automated list of publications is available on my Google Scholar page.

1. **Al Kharusi, S.,** et al. (nEXO Collab.), "Estimating cosmogenic backgrounds to nEXO at SNOLAB using Geant4 and FLUKA Monte Carlo codes", *in prep. (2024)*
2. **Al Kharusi, S.** (on behalf of nEXO), "Using GPUs to Design a Water Cherenkov Detector for a Neutrinoless Double Beta Decay Search in nEXO", (submitted to Physics in Canada, 2023)
3. Li, S. et al. (EXO-200 Collab.)"Generative adversarial networks for scintillation signal simulation in EXO-200", *JINST, 18(06), P06005*
4. Galli, L., et al. (LOLX Collab.)"Looking for Cherenkov light in liquid xenon with LoLX", *Nucl. Instrum. Meth. A. 1047 (2023): 167876*
5. Gallina, G., et al. (nEXO Collab.)"Performance of novel VUV-sensitive Silicon Photo-Multipliers for nEXO", *Eur. Phys. J. C 82.12 (2022): 1-21*
6. **Al Kharusi, S.**, et al. (EXO-200 Collab.)"Search for MeV Electron Recoils from Dark Matter in EXO-200", *arXiv:2207.00897 (2022)*
7. Lenardo, B. G., et al. (nEXO Collab.)"Development of a ^{127} Xe calibration source for nEXO", *arXiv:2201.04681 (2022)*
8. Adhikari, G., et al. (nEXO Collab.), "nEXO: Neutrinoless double beta decay search beyond 10^{28} year half-life sensitivity", *J. Phys. G. 49.1 (2021): 015104*
9. **Al Kharusi, S.**, et al. (EXO-200 Collab.), "Search for Majoron-emitting modes of Xe 136 double beta decay with the complete EXO-200 dataset", *Phys. Rev. D. 104.11 (2021)*
10. Wagenpfeil, M., et al. (nEXO Collab.), "Reflectivity of VUV-sensitive silicon photomultipliers in liquid Xenon", *JINST 16.08 (2021)*
11. Stiegler, T., et al. (nEXO Collab.), "Event reconstruction in a liquid xenon Time Projection Chamber with an optically-open field cage", *Nucl. Instrum. Meth. A. 1000 (2021): 165239.*

12. **Al Kharusi, S.**, et al. (SNEWS 2.0 Collab.), "SNEWS 2.0: A Next-Generation SuperNova Early Warning System for Multi-messenger Astronomy", *New J. Phys.(2021)*
13. P., Lv., et al. (nEXO Collab.), "Reflectance of Silicon Photomultipliers at Vacuum Ultraviolet Wavelengths", *IEEE Trans. Nucl. Sci.* vol. 67, no. 12, pp. 2501-2510, Dec. 2020, doi: 10.1109/TNS.2020.3035172
14. **Al Kharusi, S.**, et al. (EXO-200 Collab.), "Measurement of the Spectral Shape of the β-Decay of ^{137}Xe to the Ground State of ^{137}Cs in EXO-200 and Comparison with Theory", *Phys. Rev. Lett.* 124 (23), 232502 (2020)
15. Njoya, O., et al. (nEXO Collab.), "Measurements of Electron Transport in Liquid and Gas Xenon using a Laser-driven Photocathode", *Nucl. Instrum. Meth. A.* 972 (2020) 163965
16. Nakarmi, P., et al. (nEXO Collab.), "Reflectivity and PDE of VUV4 Hamamatsu SiPMs in liquid xenon", *J. Instrum.* 15 (01), (2020): P01019
17. Li, Z., et al. (nEXO Collab.), "Simulation of Charge Readout with Segmented Tiles in nEXO.", *J. Instrum.* 14.09 (2019): P09020
18. Gallina, G., et al. (nEXO Collab.), "Characterization of the Hamamatsu VUV4 MPPCs for nEXO", *Nucl. Instrum. Meth. A.* 940 (2019): 371-379
19. **Al Kharusi, S.**, et al. (nEXO Collab.), "nEXO Pre-Conceptual Design Report", arXiv:1805.11142 (2018)

Internal Documents:

20. **Al Kharusi, S.**, T. Brunner, "nEXO Outer Detector: Water Temperature Study", Tech. Rep., nEXO Internal Documents (nEXO-Sim-015), June 2020
21. **Al Kharusi, S.**, T. Brunner, D. Haggard, "Supernovae, Triggering and GPS", Tech. Rep., nEXO Internal Documents (nEXO-Sim-016), June 2020
22. **Al Kharusi, S.**, T. Brunner, "nEXO Outer Detector Size Study", Tech. Rep., nEXO Internal Documents (nEXO-Sim-012), May 2020
23. **Al Kharusi, S.**, "Cosmogenic Backgrounds to nEXO", Tech. Rep., nEXO Internal Documents (nEXO-Sim-018), January 2019