Richard Knoche

Personal Information

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Education

Expected 2016 — Doctor of Philosophy (Ph.D.) in Physics, **University of Maryland**
Thesis: "Signal Corrections and Calibrations in the LUX Dark Matter Detector"

May 2011 — Bachelor of Science (B.S.) in Physics, magna cum laude, **James Madison University**

Experience

Aug 2011 - Present

Ph.D. Candidate at The University of Maryland
The LUX Dark Matter Detector

- Worked with an international collaboration to produce the world's most sensitive WIMP-nucleon scattering cross section limits.
- Designed bench-top experiments to test the safe deployment and removal of tritiated methane in liquid xenon detectors.
- Successfully created and carried out a tritiated methane calibration protocol for the LUX detector.
- Used tritium data to produce the world's most precise electron recoil calibration in a liquid xenon TPC. This technique has been adopted by similar experiments in Asia and Europe.
- Developed novel techniques to produce 3D position dependent signal corrections in a spatially and time dependent electric field.
- Automated the extraction of hundreds of data features from krypton calibration data.
- Calibrated the detector's combined energy model.
- Helped maintain a GEANT4 based simulations framework.
- Built on-site gas sampling system for real-time monitoring of xenon impurities at the part-per-trillion level.
- Directed on-site detector operations as Deputy Science Coordination Manager.

June-Sep 2010

Research Assistant at Goddard Space Flight Center
SWIFT Gamma-Ray Burst Mission

- Analyzed data from Swift Burst Alert Telescope (BAT) to search for hard X-ray emissions around the on-set time of supernovae.
- Quantified the X-ray counterpart to Fermi-LAT pulsar observations using X-ray emission data from the Chandra and BeppoSax missions.

Aug 2008 - May 2011 | Research Assistant at James Madison University
Department of Physics and Astronomy

- Designed and maintained table-top experiments to characterize the complex, non-linear behavior of granular systems.
- Implemented computer vision techniques to quantitatively characterize particle movement in a two dimensional shear flow.
- Utilized optical polarization techniques to quantify stress networks in granular systems.
- Performed statistical analysis to characterize relevant parameters in a two dimensional granular shear flow.

Refereed Publications

1. D. S. Akerib *et al.* [LUX Collaboration], "Results from a search for dark matter in LUX with 332 live days of exposure," arXiv preprint arXiv:1608.07648 (2016). Submitted to Phys. Rev. Lett.
2. D. S. Akerib *et al.* [LUX Collaboration], "Low-energy (0.7-74 keV) nuclear recoil calibration of the LUX dark matter experiment using DD neutron scattering kinematics," arXiv preprint arXiv:1608.05381 (2016). Submitted to Phys. Rev. C.
3. D. S. Akerib *et al.* [LUX Collaboration], "Chromatographic separation of radioactive noble gases from xenon," arXiv preprint arXiv:1605.03844 (2016). Submitted to Astropart. Phys.
4. D. S. Akerib *et al.* [LUX Collaboration], "Results on the Spin-Dependent Scattering of Weakly Interacting Massive Particles on Nucleons from the Run 3 Data of the LUX Experiment," Phys. Rev. Lett. **116**, no. 16, 161302 (2016)
5. D. S. Akerib *et al.* [LUX Collaboration], "Improved Limits on Scattering of Weakly Interacting Massive Particles from Reanalysis of 2013 LUX Data," Phys. Rev. Lett. **116**, no. 16, 161301 (2016)
6. D. S. Akerib *et al.* [LUX Collaboration], "Tritium calibration of the LUX dark matter experiment," Phys. Rev. D **93**, no. 7, 072009 (2016)
7. D. S. Akerib *et al.* [LUX Collaboration], "FPGA-based Trigger System for the LUX Dark Matter Experiment," Nucl. Instrum. Meth. A **818**, 57 (2016)
8. D. S. Akerib *et al.*, "Radiogenic and Muon-Induced Backgrounds in the LUX Dark Matter Detector," Astropart. Phys. **62**, 33 (2015)
9. D. S. Akerib *et al.* [LUX Collaboration], "First results from the LUX dark matter experiment at the Sanford Underground Research Facility," Phys. Rev. Lett. **112**, 091303 (2014)
10. D. S. Akerib *et al.* [LUX Collaboration], "The Large Underground Xenon (LUX) Experiment," Nucl. Instrum. Meth. A **704**, 111 (2013)
11. D. S. Akerib *et al.* [LUX Collaboration], "Technical Results from the Surface Run of the LUX Dark Matter Experiment," Astropart. Phys. **45**, 34 (2013)

Conference Proceedings

1. A. Murphy *et al.* [LUX Collaboration], "The LUX direct dark matter search," AIP Conf. Proc. **1743**, 050012 (2016)
2. C. Carmona-Benitez *et al.* [LUX Collaboration], "First Results of the LUX Dark Matter Experiment," Nucl. Part. Phys. Proc. **273-275**, 309 (2016).

3. M. Moongweluwan *et al.* [LUX Collaboration], "The impact of photon flight path on S1 pulse shape analysis in liquid xenon two-phase detectors" JINST **11**, no. 02, C02036 (2016)
4. D. Akerib *et al.* [LUX Collaboration], "The LUX Experiment," Phys. Procedia **61**, 74 (2015).
5. M. Horn *et al.* [LUX Collaboration], "Results from the LUX dark matter experiment," Nucl. Instrum. Meth. A **784**, 504 (2015).
6. A. Bradley *et al.* [LUX Collaboration], "Radon-related Backgrounds in the LUX Dark Matter Search," Phys. Procedia **61**, 658 (2015).
7. C. Faham *et al.* [LUX Collaboration], "First Dark Matter Search Results from the Large Underground Xenon (LUX) Experiment," arXiv:1405.5906 (2014).
8. M. Szydagis *et al.* [LUX Collaboration], "A Detailed Look at the First Results from the Large Underground Xenon (LUX) Dark Matter Experiment," arXiv:1402.3731 (2014).
9. V. Gehman *et al.* [LUX Collaboration], "Direct Search for Dark Matter with Two-Phase XENON Detectors: Current Status of Lux and Plans for LZ," Frascati Phys. Ser. **58**, 51 (2014).
10. M. Woods *et al.* [LUX Collaboration], "Underground Commissioning of LUX," arXiv:1306.0065 (2013)
11. S. Fiorucci *et al.* [LUX Collaboration], "The LUX Dark Matter Search – Status Update," J. Phys. Conf. Ser. **460**, 012005 (2013)

Conference Presentations

- "Development of the LUX detector's CH3T calibration source and ER response," APS April Meeting, Baltimore, Maryland (April 2015)
- "Search for the X-ray Counterpart of Pulsars with GeV Emissions," American Astronomical Society Meeting, Seattle, Washington (Jan 2011)

Professional Organizations

- American Physical Society

Honors

August 2010	John Mather Nobel Scholar Award
March 2010	Henry W. Leap Scholarship
March 2010	Sigma Pi Sigma
2009-2011	President's List, James Madison University
2008-2011	Dean's List, James Madison University