

Karri Folan DiPetrillo

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RESEARCH INTERESTS

Experimental high energy particle physics, Beyond the Standard Model searches, unconventional track signatures, silicon pixel detectors, AI-on-chip, future colliders

EMPLOYMENT

Neubauer Assistant Professor, University of Chicago	2023-
Lederman Fellow, Fermi National Accelerator Laboratory	2019-2022

EDUCATION

Ph.D Physics, Harvard University	2019
M.A Physics, Harvard University	2015
B.S. Biological Physics, Brown University	2013

AWARDS

Partnerships for Emerging Technologies, CMOS Pixel Sensors: Enabling Discoveries with Advanced US Microelectronics	2023-2024
Neubauer Assistant Professor Award, University of Chicago	2023
LHC Physics Center Distinguished Researcher	2022
University of Chicago Rising Star in Physics	2021
Fermilab New Initiatives, Advanced Silicon Timing Sensors for Future Trackers	2020
Lederman Fellowship, Fermilab	2019-2022
ATLAS Thesis Award	2019

Harvard University

Frederick Sheldon Travel Fellowship	2017-2018
Harold A. Berry Scholarship	2016-2018
Charles Smith Fellowship Award	2013-2016
Harold T White Prize for Teaching Excellence	2015
Bok Center Teaching Award, Harvard University	2014

Brown University

R. Bruce Lindsay Prize for Excellence in Physics	2013
Karen T. Romer Undergraduate Teaching and Research Award	2011 & 2012
Magna cum laude and Department Honors	2013
Elected to Sigma Xi for Associate Membership	2013

APPOINTED POSITIONS

US LHC Users Association Executive Committee	2024-
ATLAS SUSY R-Parity Violation and Long-lived Group Convener	2023-
US Muon Collider Coordination Committee, MDI and Forward Detectors	2023
CMS Exotica Long-lived Particle Group Convener	2020-2022
CMS ZV search, Analysis Review Committee Member	2021
CMS Displaced jets search, Analysis Review Committee Member	2019-2020

PUBLICATIONS

This section contains results in which I was a primary analyzer or made important contributions. In total, I'm an author on 394 papers by the ATLAS Experiment and 175 by the CMS Experiment.

Search for soft unclustered energy patterns in proton-proton collisions at 13 TeV. the CMS Collaboration, <i>submitted to PRL</i> , arxiv:2403.05311	2024
Fermilab Accelerator Complex Evolution Science Workshop Report, arxiv:2403.02422	2024
Smartpixels: Towards on-sensor inference of charged particle track parameters and uncertainties, Dickinsen et. al. arxiv:2312.11676	2023

- Smart pixel sensors: towards on-sensor filtering of pixel clusters with deep learning. J. Yoo et al., *submitted to MLST*, arxiv:2310.02474 2023
- Search for heavy, long lived charged particles with large specific ionisation and low-beta in pp collisions at $\sqrt{s} = 13$ TeV using the ATLAS experiment. The ATLAS Collaboration, ATLAS-CONF-2023-044 2023
- The ATLAS Experiment at the CERN Large Hadron Collider: A Description of the Detector Configuration for Run 3. The ATLAS Collaboration. *JINST*, arxiv:2305.16623 2023
- Search for long-lived, massive particles in events with displaced vertices and multiple jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. The ATLAS Collaboration. *JHEP*, arxiv:2301.13866 2023
- Optimizing Trigger-Level Track Reconstruction for Sensitivity to Exotic Signatures. Di Petrillo et. al. *JHEP*, arxiv:2211.05720 2022
- Report of the Topical Group on Physics Beyond the Standard Model at Energy Frontier for Snowmass 2021. Bose et. al. *Snowmass White Paper*, arxiv:2209.13128 2022
- Solid State Detectors and Tracking for Snowmass. Affolder et. al. *Snowmass White Paper*, arxiv:2209.03607 2022
- Muon Collider Forum Report. Black et. al. *JINST*, arxiv:2209.01318 2022
- Theory, phenomenology, and experimental avenues for dark showers. Albouy et. al. *EPJC*, arxiv:2203.09503 2022
- Track-Based Triggers for Exotic Signatures. Di Petrillo et. al. *Snowmass White Paper*, arxiv:2203.07314 2022
- Review of opportunities for new long-lived particle triggers in Run 3 of the Large Hadron Collider. Alimena et. al. *LPCC Report*, arXiv:2110.14675 2021
- Combined analysis of HPK 3.1 LGADs using a proton beam, beta source, and probe station towards establishing high volume quality control. Heller et. al. *NIMA*, arxiv:2104.08369 2021
- Resistive AC-Coupled Silicon Detectors: principles of operation and first results from a combined analysis of beam test and laser data. Tornago et. al. *NIMA*, arxiv:2007.09528 2021
- Measurements of an AC-LGAD strip sensor with a 120 GeV proton beam. Apresyan et. al. *JINST*, arxiv:2006.01999 2020
- Observation of the production of three massive bosons at $\sqrt{s}=13$ TeV. The CMS Collaboration. *PRL*, arXiv:2006.11191 2020

Search for long-lived, massive particles in events with a displaced vertex and a muon with large impact parameter in pp collisions at $\sqrt{s}=13$ TeV with the ATLAS detector. The ATLAS Collaboration. <i>PRD</i> , arxiv:2003.11956	2020
The ATLAS Collaboration. ATLAS data quality operations and performance for 2015–2018 data-taking. <i>JINST</i> , arxiv:1911.04632	2019
Performance of vertex reconstruction algorithms for detection of new long-lived particle decays within the ATLAS inner detector. The ATLAS Collaboration. ATL-PHYS-PUB-2019-013	2019
Reinterpretation of searches for supersymmetry in models with variable R -parity-violating coupling strength and long-lived R -hadrons. The ATLAS Collaboration ATLAS-CONF-2018-003	2018
Measurements of gluon-gluon fusion and vector-boson fusion Higgs boson production cross-sections in the $H \rightarrow WW^* \rightarrow e\nu\mu\nu$ decay channel in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. The ATLAS Collaboration. <i>PLB</i> , arxiv:1808.09054	2018
Search for long-lived, massive particles in events with displaced vertices and missing transverse momentum in $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector. The ATLAS Collaboration. <i>PRD</i> , arxiv:1710.04901	2017
Measurements of the production cross section of a Z boson in association with jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. The ATLAS Collaboration. <i>EPJC</i> , arxiv:1702.05725	2017
Measurements of the Higgs boson production cross section via Vector Boson Fusion and associated WH production in the $WW^* \rightarrow l\nu l\nu$ decay mode with the ATLAS detector at $\sqrt{s} = 13$ TeV. The ATLAS Collaboration ATLAS-CONF-2016-112	2016

CONFERENCE PRESENTATIONS

<i>Physics at a Muon Collider</i> (invited) International Symposium on Particles, String and Cosmology (PASCOS), Vietnam	2024
<i>Physics, Detectors, and Software Status</i> (invited) International Muon Collider Annual Meeting	2024
<i>Muon Collider Detector Status</i> (invited) Hokkaido Workshop on Particle Physics at Crossroads	2024
<i>Detector Status, Challenges, Requirement</i> (invited) Princeton US Muon Collider Planning Workshop	2024
<i>Physics Motivation for Muon-based Colliders</i> (invited) The 1st Workshop on the Muon-Ion Collider	2023

<i>US Future Collider Options</i> (invited) Windows on the Universe, Rencontres du Vietnam	2023
<i>Track-Based Triggers for Exotic Signatures</i> Eleventh LHC Long-lived Particle Workshop, CERN	2022
<i>Long-lived particle searches at the LHC</i> (invited) New ideas and methods in particle physics, Aspen Center for Physics	2022
<i>Off the Beaten Track: Unconventional Searches at the LHC</i> (invited) Rising Stars in Experimental Particle Physics, University of Chicago	2021
<i>CMS in 10 minutes</i> (invited) New Perspectives, Fermilab	2021
<i>Searches for long-lived particles with the CMS experiment</i> Meeting of the Division of Particle and Fields, Florida State University	2021
<i>SUEP simulation</i> (invited) Ninth LHC Long-lived Particle Workshop, CERN	2021
<i>ATLAS and CMS Multiboson Measurements</i> Standard Model at the LHC, CERN	2021
<i>AC-LGAD strip sensor measurements with 120 GeV protons</i> IEEE NSS MIC Conference, Boston, MA	2020
<i>AC-LGAD strip sensor measurements with 120 GeV protons</i> RD50 Workshop, CERN	2020
<i>Development of the CMS MTD Endcap Timing Layer for the High luminosity LHC</i> International Conference on High Energy Physics (ICHEP), Prague, Czech Republic	2020
<i>ATLAS search for a displaced vertex and a muon</i> (invited) Seventh LHC Long-Lived Particle Workshop, CERN	2020
<i>Search for Supersymmetry in events with a displaced vertex and a muon in ATLAS</i> Moriond Electroweak, La Thuile, Italy	2019
<i>Searches for Supersymmetry in signatures with long-lived particles in ATLAS</i> Windows on the Universe, Rencontres du Vietnam	2018
<i>Reinterpreting prompt ATLAS Supersymmetry searches in long-lived scenarios</i> Third LHC Long-Lived Particle Workshop, CERN	2018
<i>Overview of ATLAS long-lived particle searches</i> (invited) Second LHC Long-Lived Particle Workshop, ICTP, Trieste, Italy	2017
<i>Measurement of Standard Model Higgs Couplings and Cross Sections in ATLAS</i> High Energy Physics and Quantum Field Theory, Yaroslavl, Russia	2017
<i>Z+Jets at 13 TeV in ATLAS</i> Second China LHC Workshop, Beijing, China	2016

COLLOQUIA & SEMINARS

<i>Towards a 10 TeV Muon Collider: Today's R&D for Tomorrow's Discoveries</i>	2023
Seminars at University of Chicago, University of Maryland, Fermilab, Argonne, University of Illinois Urbana-Champaign, Sydney CPPC	
<i>Off the Beaten Track: Unconventional Searches at the LHC</i>	2022
Colloquia at University of Chicago, University of Pennsylvania, Brown University	
<i>Off the Beaten Track: Long-Lived Particle Searches at the LHC</i>	2021-2022
Seminars at UW Madison, Purdue, Texas A&M, University of Tennessee	
<i>Off the Beaten Track: Displaced Vertex Searches at the LHC</i>	2021
Seminar at University of Maryland	
<i>SUEPed up Searches at the LHC</i>	2021
Seminar at Carnegie Mellon, NSF AI Planning Institute	
<i>Off the Beaten Track: Unconventional Searches at the LHC</i>	2020
Seminars at Brookhaven National Laboratory, and University of Tennessee	
<i>Triboson Observation in CMS</i>	2020
Seminar at Fermilab	
<i>Long-lived particle searches with displaced vertices at the LHC featuring the ATLAS Muon Spectrometer</i>	2019
Seminars at University of Michigan, Fermilab, Princeton, SLAC, Berkeley	

SERVICE

University of Chicago

Pheonix STEM Hiring Committee	2024
Graduate Admissions Committee	2023-2024
Enrico Fermi Institute Colloquium Committee	2023-2024

Conference organization

Inaugural US Muon Collider Community Meeting	2024
Aspen High Energy Physics Winter Conference	2024
International Muon Collider Machine Detector Interface Workshop	2024
Fermilab Accelerator Complex Evolution Science Workshop	2023
LHC Long-lived Particle Community Workshops (VIII-XIII)	2020-2023
US Muon Collider Physics & Detector Workshop	2022
Snowmass Summer Meeting, Industry Night	2022
CMS Exotica Workshop, Long-lived Session	2020 & 2021

LHC Physics Center

Colliders of Tomorrow Committee	2023
Topic of the Week Seminar Committee	2022
Journal Club Creator and Organizer	2019-2022
Data Analysis School, Exercise Facilitator	2020

Reviewer for US Department of Energy, SLAC LDRD, DPF Instrumentation Award

TEACHING

Muon Colliders, Fermilab Summer School	2024
Introduction to Mechanics, UChicago	2023-2024
Particle Physics at the LHC, Fermilab Undergraduate Lectures	2020-2024
Honors Mechanics and Special Relativity, Harvard Teaching Fellow	2014
Rhode Island Urban Debate League, Coach and Americorp Access Scholar	2009-2013

MENTORING

University of Chicago

Aleksandra Snoch (Postdoc)	ATLAS Pixel Upgrade, Pixel dE/dx
Teresa Du (PhD Student)	Pixel dE/dx
Matias Mantinan (PhD Student)	ATLAS Tracker Upgrade
Eliza Howard (PhD Student)	Smart Pixels
Rachel Kovach-Fuentes (Undergraduate student)	Smart Pixels
Aidan Nicholas (Undergraduate student)	Smart Pixels
Tate Flicker (Undergraduate Student)	ATLAS Tracker Upgrade
Carissa Kumar (Post-bacc)	Smart Pixels
Emily Pan (Undergraduate Student)	Smart Pixels
Tanvi Rao (Undergraduate Student)	ATLAS Pixel Performance
Leo Rozanov (Post-bacc)	Muon Collider
Noah Virani (Undergraduate Student)	Muon Collider
Ryan Michaud (Undergraduate Student)	Muon Collider
Daniel Fu (Undergraduate Student)	Muon Collider
Isaac Hirsch (Undergraduate Student)	Muon Collider
Jonathan Ran (Undergraduate Student)	Muon Collider

Fermilab

Chris Guo (SULI Student)	Snowmass Track Triggers
Tres Reid (PhD Student)	SUEP analysis
Stuart Johnson (Undergraduate Student)	SUEP analysis
Tianyu Justin Yang (PhD Student)	USCMS Mentor
Christos Papegeorgiakos (PhD Student)	USCMS Mentor
Meutia Wulansatiti (PhD Student)	USCMS Mentor

Harvard University

Madeline Bernstein (Undergraduate Student)	cosmic muon studies
Benjamin Garber (Undergraduate Student)	$H \rightarrow WW^*$

OUTREACH

Expanding your horizons workshop for middle school girls: 2020-2024

Co-organized hands-on workshops to teach middle school students basic particle physics concepts. Expanding your horizons is a one-day conference to encourage young women in under-resourced areas of Chicago to pursue careers in STEM.

NAACP ACT-SO program DuPage County: 2023

Taught high school participants how to present research at final science competition

Saturday Morning Physics On-Site Coordinator and Lecturer: 2019-2022

Led the transition to virtual lectures during Covid to avoid canceling the program, and added a new lecture focused on physics at the Large Hadron Collider.

Interviews and Articles:

Interview with Symmetry Magazine on Muon Collider	2024
CERN Courier Opinion Article on Future Colliders	2023
Interview with TARGET students for Women of Particle Physics Module	2020
Interview with Symmetry Magazine on CMS precision timing detector upgrade	2019

Harvard Science in the News

Editor in Chief for the short-form division	2017-2018
Short form writer	2015-2017
Reddit AMA (Ask Me Anything) on research at Harvard	2015