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, silicon detector R&D, 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 Subgroup Convener	2023-
US Muon Collider Coordination Committee, MDI and Foward Detectors	2023
CMS Exotica Long-lived Particle Subgroup 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, *submitted to PRL*, arxiv:2403.05311	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., 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. *PRD*, arxiv:2003.11956	2020

The ATLAS Collaboration. ATLAS data quality operations and performance for 2015–2018 data-taking. *JINST*, 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 $H \to WW^* \to e\nu\mu\nu$ decay channel in pp collisions at $\sqrt{s}$ = 13 TeV with the ATLAS detector. The ATLAS Collaboration. *PLB*, 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. *PRD*, 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. *EPJC*, arxiv:1702.05725 2017

Measurements of the Higgs boson production cross section via Vector Boson Fusion and associated WH production in the $WW^\star \to l\nu l\nu$ decay mode with the ATLAS detector at $\sqrt{s}$ = 13 TeV. The ATLAS Collaboration ATLAS-CONF-2016-112 2016

CONFERENCE PRESENTATIONS

Physics, Detectors, and Software (invited) 2024
International Muon Collider Annual Meeting

Muon Collider Detector Status (invited) 2024
Hokkaido Workshop on Particle Physics at Crossroads

Detector Status, Challenges, Requirement (invited) 2024
Princeton US Muon Collider Planning Workshop

Physics Motivation for Muon-based Colliders (invited) 2023
The 1st Workshop on the Muon-Ion Collider

US Future Collider Options (invited) 2023
Windows on the Universe, Rencontres du Vietnam

Track-Based Triggers for Exotic Signatures 2022
Eleventh LHC Long-lived Particle Workshop, CERN

Long-lived particle searches at the LHC (invited) 2022
New ideas and methods in particle physics, Aspen Center for Physics

Off the Beaten Track: Unconventional Searches at the LHC (invited) 2021
Rising Stars in Experimental Particle Physics, University of Chicago

CMS in 10 minutes (invited) 2021
New Perspectives, Fermilab

Searches for long-lived particles with the CMS experiment 2021
Meeting of the Division of Particle and Fields, Florida State University

SUEP simulation (invited) 2021
Ninth LHC Long-lived Particle Workshop, CERN

ATLAS and CMS Multiboson Measurements 2021
Standard Model at the LHC, CERN

AC-LGAD strip sensor measurements with 120 GeV protons 2020
IEEE NSS MIC Conference, Boston, MA

AC-LGAD strip sensor measurements with 120 GeV protons 2020
RD50 Workshop, CERN

Development of the CMS MTD Endcap Timing Layer for the High luminosity LHC 2020
International Conference on High Energy Physics (ICHEP), Prague, Czech Republic

ATLAS search for a displaced vertex and a muon (invited) 2020
Seventh LHC Long-Lived Particle Workshop, CERN

Search for Supersymmetry in events with a displaced vertex and a muon in ATLAS 2019
Moriond Electroweak, La Thuile, Italy

Searches for Supersymmetry in signatures with long-lived particles in ATLAS 2018
Windows on the Universe, Rencontres du Vietnam

Reinterpreting prompt ATLAS Supersymmetry searches in long-lived scenarios 2018
Third LHC Long-Lived Particle Workshop, CERN

Overview of ATLAS long-lived particle searches (invited) 2017
Second LHC Long-Lived Particle Workshop, ICTP, Trieste, Italy

Measurement of Standard Model Higgs Couplings and Cross Sections in ATLAS 2017
High Energy Physics and Quantum Field Theory, Yaroslavl, Russia

Z+Jets at 13 TeV in ATLAS 2016
Second China LHC Workshop, Beijing, China

COLLOQUIA & SEMINARS

Towards a 10 TeV Muon Collider: Today's R&D for Tomorrow's Discoveries 2023
Seminars at University of Chicago, University of Maryland, Fermilab, Argonne, University of Illinois Urbana-Champaign, Sydney CPPC

Off the Beaten Track: Unconventional Searches at the LHC 2022
Colloquia at University of Chicago, University of Pennsylvania, Brown University

Off the Beaten Track: Long-Lived Particle Searches at the LHC 2021-2022
Seminars at UW Madison, Purdue, Texas A&M, University of Tennessee

Off the Beaten Track: Displaced Vertex Searches at the LHC 2021
Seminar at University of Maryland

SUEPed up Searches at the LHC 2021
Seminar at Carnegie Mellon, NSF AI Planning Institute

Off the Beaten Track: Unconventional Searches at the LHC 2020
Seminars at Brookhaven National Laboratory, and University of Tennessee

Triboson Observation in CMS 2020
Seminar at Fermilab

Long-lived particle searches with displaced vertices at the LHC featuring the ATLAS Muon Spectrometer 2019
Seminars at University of Michigan, Fermilab, Princeton, SLAC, Berkeley

SERVICE

UChicago Graduate Admissions Committee 2023

DPF Instrumentation Award Committee 2023

Conference organization

- International Muon Collider Machine Detector Interface Workshop 2024
- Aspen High Energy Physics Winter Conference 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

TEACHING

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 Tracker Upgrade, Pixel dE/dx
Anthony Badea (AI/Schmidt Fellow)	Smart Pixels, Muon Collider
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 Nichols (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 Papgeorgiakis (PhD Student)	USCMS Mentor
Meutia Wulansatiti (PhD Student)	USCMS Mentor

Harvard University

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

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:

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