

# James Beacham

EXPERIMENTAL PARTICLE PHYSICIST · DUKE UNIVERSITY

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## Now

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Post-doctoral researcher with Duke University, working on the ATLAS Experiment, based full-time at CERN (from October 2018)  
— Previously a post-doctoral researcher with Ohio State University (from June 2014 to October 2018)

## Education

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### New York University

*New York, New York*

PH.D., EXPERIMENTAL PARTICLE PHYSICS — ADVISOR: KYLE CRANMER

*May 2014*

- Thesis Title: “A Searches: Looking for New Physics with the ATLAS, APEX, and ALEPH Experiments”

## Research interests

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I search for long-lived particles (LLPs) beyond the Standard Model (BSM) with the ATLAS experiment at the LHC, because searches for such signatures could generically result in discoveries (such as exotic decays of the Higgs boson, supersymmetry, dark photons, or right-handed neutrinos) and because they have traditionally been marginalized in favor of searches for promptly-decaying BSM particles. I’m currently spearheading the search in ATLAS data for emerging jets, an LLP signature that could be evidence of a QCD-like dark sector. I founded the LHC LLP Community, a grassroots initiative involving members of ATLAS, CMS, and LHCb, the theory/phenomenology world, and those interested in dedicated LLP detectors beyond the three main experiments, where the sole purpose of the group is to provide a platform for critical discussion about what LLP signatures we may be missing. I also initiated and serve as one of two editors of the LHC LLP community white paper. To ensure we don’t miss more subtle LLP signatures in the upcoming high-luminosity era of the LHC from a hardware perspective, I lead a team that set up and performs tests for silicon strips for the ITk, the proposed upgrade of the ATLAS inner tracker. Additionally, I search for exotic decays of the SM-like Higgs boson and BSM particles that could result in non-standard photon signatures. I have extensive computing and data preparation experience, having served as ATLAS prompt reconstruction coordinator for one and a half years. I’m also interested in future collider experiments such as the FCC and CEPC and have participated in workshops and studies for such machines. Finally, I’m a high-profile public speaker and I specialize in novel and inventive ways of engaging with non-specialists about science and society. I trained as a filmmaker before becoming a physicist and I regularly collaborate with artists and I create projects exploring the connections between particle physics and experimental music and film.

## Leadership positions

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Coordinator of FELIX-based test bench at CERN for R&D with silicon strips for DAQ system for ATLAS ITk upgrade [October 2018 to present]

Coordinator for ATLAS participation in a novel, multi-experiment art/science collaboration called Origin [September 2018 to present]

Prompt data reconstruction coordinator (PROC) for central ATLAS software at the CERN Tier0 data centre [May 2017 to January 2019]

Founder/organizer of the LHC Long-Lived Particle Community, a collaborative effort among ATLAS, CMS, LHCb, and theorists, as well as dedicated experiments such as MilliQan, Moedal, MATHUSLA, etc. [Spring 2016 to present]

Convener of the Unconventional signatures and Exotic Higgs (UEH) sub-group of the Exotics research group in ATLAS [April 2015 - April 2016]

Liaison for the Higgs-to-light-resonances physics domain of the beyond-the-Standard-Model Higgs sub-group (HBSM) of the Higgs research group in ATLAS, coordinating all analysis efforts searching for the SM Higgs boson decaying to exotic light particles [October 2014 to November 2017]

## Selected papers

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I am an author on over 500 research papers. A complete list can be found at <http://inspirehep.net/search?ln=en&p=beacham+james>. Below is a selection of papers for which I was the or a primary contributor.

Not included here: Proceedings contributed in 2010 and 2012.

### LHC LONG-LIVED PARTICLE COMMUNITY

**Searching for long-lived particles beyond the Standard Model at the Large Hadron Collider at CERN [editor]**

*Accepted for publication in J. Phys.*

ARXIV:1903.04497

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*March 2019*

**Physics Beyond Colliders at CERN: Beyond the Standard Model Working Group Report**Accepted for publication in *J. Phys.*

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ARXIV:1901.09966

January 2019

## ATLAS — AS PRIMARY AUTHOR OR CORE CONTRIBUTOR

**Search for pairs of highly collimated photon-jets in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector**

PRD 99, 012008 (2019)

ARXIV:1808.10515

January 2019

**Performance of the ATLAS global transverse-momentum triggers at  $\sqrt{s} = 8$  TeV**

ATL-DAQ-PUB-2018-001

<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PUBNOTES/ATL-DAQ-PUB-2018-001/>

March 2018

**Search for resonances in diphoton events with the ATLAS detector at  $\sqrt{s} = 13$  TeV**

JHEP09 (2016) 001

ARXIV:1606.03833

September 2016

**Search for new phenomena in events with at least three photons collected in pp collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector**

EPJC 76 (2016) 4, 210

ARXIV:1509.05051

April 2016

## ATLAS — AS SUB-GROUP CONVENER

**Search for magnetic monopoles and stable particles with high electric charges in 8 TeV pp collisions with the ATLAS detector**

PRD 93, 052009

ARXIV:1509.08059

March 2016

**A search for prompt lepton-jets in pp collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector**

JHEP 1602 (2016) 062

ARXIV:1511.05542

February 2016

**Search for heavy long-lived multi-charged particles in pp collisions at  $\sqrt{s} = 8$  TeV using the ATLAS detector**

EPJC (2015) 75:362

ARXIV:1504.04188

August 2015

**Search for long-lived, weakly interacting particles that decay to displaced hadronic jets in proton-proton collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector**

PRD 92 (2015) 1, 012010

ARXIV:1504.03634

July 2015

## RD42

**A 3D diamond detector for particle tracking**

NIMA 824 (2016) 402-405

[HTTP://INSPIREHEP.NET/RECORD/1458074](http://inspirehep.net/record/1458074)

July 2016

- Frontier Detectors for Frontier Physics: Proceedings of the 13th Pisa Meeting on Advanced Detectors

## APEX

**Search for a New Gauge Boson in Electron-Nucleus Fixed-Target Scattering by the APEX Experiment**

Phys.Rev.Lett. 107 (2011) 191804

ARXIV:1108.2750

2011

## ALEPH

**Search for neutral Higgs bosons decaying into four taus at LEP2**

JHEP 1005 (2010) 049

ARXIV:1003.0705

2010

## Academic talks – selected

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Not included here: Invited talks given remotely at international workshops and posters at workshops and conferences.

### ATLAS / LHC

#### Searching for long-lived particles at current and future high-energy colliders

INTERPRETING THE LHC RUN 2 DATA AND BEYOND

*ICTP, Trieste, Italy*

*May 2019*

#### Searching for long-lived particles at the LHC

INTERPLAY BETWEEN PARTICLE AND ASTROPARTICLE PHYSICS (IPA2018)

*Cincinnati, Ohio*

*October 2018*

#### Searching for beyond-the-Standard Model Higgs bosons at ATLAS and CMS

25TH INTERNATIONAL CONFERENCE ON SUPERSYMMETRY AND THE UNIFICATION OF FUNDAMENTAL INTERACTIONS (SUSY17)

*Mumbai, India*

*December 2017*

#### Searches for long-lived particles at the LHC

FUTURE OF COLLIDER SEARCHES FOR DARK MATTER

*Fermilab, Batavia, Illinois*

*July 2017*

#### Dark Matter Searches and Combined Interpretations at the ATLAS Experiment at 13 TeV

5TH INTERNATIONAL CONFERENCE ON NEW FRONTIERS IN PHYSICS

*Crete, Greece*

*July 2016*

#### Searches Exploiting the Higgs Boson as a Dark/Hidden Sector Portal at the LHC: Run 1 Results and Run 2 Prospects [ATLAS + CMS results]

25TH INTERNATIONAL WORKSHOP ON WEAK INTERACTIONS AND NEUTRINOS (WIN2015)

*Heidelberg, Germany*

*June 2015*

### FUTURE COLLIDERS AND DETECTORS

#### Searching for long-lived particles at future circular colliders — Prospects and unknowns

INTERNATIONAL WORKSHOP ON HIGH ENERGY CIRCULAR ELECTRON POSITRON COLLIDER

*Beijing, China*

*Nov. 2018*

#### Searching for long-lived particles at future circular colliders

INTERNATIONAL WORKSHOP ON HIGH ENERGY CIRCULAR ELECTRON POSITRON COLLIDER

*Beijing, China*

*Nov. 2017*

### EXPERIMENTAL OVERVIEW

#### Lost in a Dark Photon Wood: Searches for Light Hidden Gauge Bosons at Colliders and Fixed Target Experiments

CHALLENGES IN THE DARK SECTOR: ALTERNATIVES TO THE WIMP PARADIGM WORKSHOP AT INFN FRASCATI

*Frascati, Italy*

*Nov. 2015*

### APEX (DARK PHOTON EXPERIMENT AT JEFFERSON LAB)

#### APEX: The A Prime EXperiment at JLab

MULTIPLE LOCATIONS

Numerous talks given at international conferences and workshops; see long form CV for details.

*Worldwide*

*2012-2015*

### ALEPH

#### $h \rightarrow 2a \rightarrow 4\tau$ at ALEPH

RENCONTRES DE MORIOND: QCD AND HIGH ENERGY INTERACTIONS

*La Thuile, Italy*

*March 2010*

### SEMINARS

#### Searching for long-lived particles with the central detectors of the LHC and future high-energy colliders

CERN EP / TH FACULTY MEETING

*CERN*

*June 2019*

## Hardware and experimental operations

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### ATLAS

#### **Coordination and development of FELIX-based test bench and R&D with silicon strips for DAQ system for ATLAS ITk upgrade**

CERN

October 2018 to present

- Hardware testing, code development, logistics, team leading, etc. I set up a testing station from scratch and led a team to debug, develop, and eventually successfully run tests on chips.

#### **Coordinator for prompt reconstruction of ATLAS collision data (PROC) at the CERN Tier0 data centre**

CERN

May 2017 to January 2019

- Prompt reconstruction of proton-proton and heavy ion collision data for ATLAS collaboration

#### **Online shifter for high-level trigger desk in ATLAS control room**

CERN

2015 to present

- Data-taking periods for proton-proton and heavy ion collisions

#### **Studies of 2012 ATLAS MET trigger performance and prediction of rates and efficiencies in 2015**

CERN

2013 to 2015

- Service work for ATLAS authorship qualification

### RD42

#### **Beam tests investigating future diamond-based particle detector technology at the Paul Scherrer Institute**

Villigen, Switzerland

2014 to 2017

- Experimental setup and data-taking for beam tests investigating the potential usage of diamond-based particle detector technology for the planned ATLAS and CMS detector upgrades for the High-Luminosity LHC
- Shifter for data-taking runs with pion beams of varying flux incident on diamond samples with pad and pixel geometries

### APEX

#### **Target operation and DAQ shifter for APEX test run, Hall A, Jefferson Lab**

Newport News, VA

July 2010

- Completed radiation worker training, assisted in calibration of PMTs in Hall A high resolution spectrometers, took shifts during data taking periods

## Professional activities

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#### **Founder of inter-experiment group dedicated to long-lived particles (LLPs)**

CERN

THE LHC LONG-LIVED PARTICLE COMMUNITY INITIATIVE

Early 2016

- Initiator and co-founder, with members of the CMS, LHCb, and ATLAS experiments, as well as theorists and phenomenologists, of the LHC Long-Lived Particle (LLP) Community initiative in the beginning of 2016. Served as the main organizer of all of its activities under the banner of the LHC Physics Centre at CERN (LPCC), leading to six workshops, an egroup with more than 200 members, and a community white paper, made public in March of 2019 and as of December 2019 accepted for publication in Journal of Physics G, charting the course of LLP searches in the future, of which I am one of two main editors, along with theorist Brian Shuve

#### **Supervisor of summer students**

CERN

RESEARCH EXPERIENCE FOR UNDERGRADUATES PROGRAM AT CERN

Summer 2019

- Supervisor of summer students visiting CERN from the U.S. REU program.

## Core workshop organizer

ICISE, Vietnam

NEW PHYSICS WITH EXOTIC AND LONG-LIVED PARTICLES: A JOINT ICISE-CBPF WORKSHOP

July 2019

- Core organizer of a workshop devoted to searches for new physics utilizing exotic and long-lived particles at facilities and projects around the world.

## Core workshop organizer

CERN; ICTP, Trieste, Italy; CERN;  
Nikhef, Amsterdam, Netherlands;  
CERN; Ghent, Belgium

SEARCHING FOR LONG-LIVED PARTICLES AT THE LHC: {FIRST, SECOND, THIRD, FOURTH, FIFTH, AND SIXTH} WORKSHOP(S) OF THE LHC LLP COMMUNITY

April and October 2017; May and October

2018; May and November 2019

- Core organizer of six majors workshop of the LHC LLP Community effort, devoted to searches for long-lived particles at the LHC among theorists and the ATLAS, CMS, LHCb experiments as well as dedicated projects such as milliQan, MoEDAL, SHiP, MATHUSLA, CODEX-b, and others — more information here: <https://longlivedparticles.web.cern.ch/node/26>

## Supervisor of summer students

CERN

CALIFORNIA STATE UNIVERSITY SUMMER STUDENT PROGRAMME AT CERN

Summer 2017, 2018

- Supervisor of three summer students visiting CERN from the California State University system, focusing on underserved groups in STEM fields.

## Core workshop organizer

CERN

LHC LONG-LIVED PARTICLE MINI-WORKSHOP

May 2016

- Core organizer for workshop devoted to long-lived particle searches in LHC Run 2 among theorists and the ATLAS, CMS, and LHCb experiments

## Scientific organizing committee for workshop

Cosenza, Italy

SEARCHING FOR EXOTIC HIDDEN SIGNATURES WITH ATLAS IN LHC RUN 2: MINI-WORKSHOP ON THE DETECTION OF DARK

SECTOR SIGNALS

February 2016

## Referee for Physics Letters B and JHEP

CERN

2015 to present

## Internal reviewer of ATLAS publications

CERN

2015 to present

## Software

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C++, Python, FORTRAN, UNIX/Linux and related OSs, shell scripting, XML, HTML, Git, ROOT/RooStats, Mathematica

## Teaching

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### Teaching Assistant

New York University

MULTIPLE COURSES

2008 - 2010

### Supervisor

CERN

SUMMER STUDENTS / INTERNS

Summers of 2017, 2018, and 2019

## Outreach / public appearances

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All events: <https://jbbeacham.com/outreach>

In addition to my research, I specialize in novel, high-impact engagement with non-specialists at popular science, technology, futurism, start-up culture, entrepreneurship, design, and art/science events around the world, including the American Museum of Natural History, the Royal Institution, the Guggenheim Museum Bilbao, SXSW, the Exploratorium, Gizmodo Studios, The Next Web Conference, and BBC MediaCityUK, among many others.

My talk, “How we explore unanswered questions in physics” [<https://go.ted.com/Cyy7>], was featured on TED.com and has been viewed more than 1.5 million times. I contribute to podcasts and radio shows, including NPR’s “Science Friday”; participate in documentaries on the BBC, Discovery, Smithsonian, and independent feature productions; and I’ve been featured in The New York Times, Wired, and Gizmodo, among others.

I trained as a filmmaker before training as a physicist (I have separate bachelor’s degrees in film studies and physics/math), and I’m frequently invited to events and to participate in projects exploring the intersection of art and science, and I regularly collaborate with artists. In 2015 I launched a project called Ex/Noise/CERN...

<https://exnoisecern.ch/>

...that explores the connections between particle physics an experimental music and film, to celebrate the LHC’s switch on to 13 trillion electron volts. The video [<https://exnoisecern.ch/film>] of the first episode was covered extensively in the popular music and science press and within a few days of being live was ranked among the top ten most-watched videos ever produced by CERN.