

# James Beacham

EXPERIMENTAL PARTICLE PHYSICIST · DUKE UNIVERSITY

CERN, 15-R-007, Esplanade des particules 1, 1217 Meyrin, Switzerland

✉ j.beacham@cern.ch | 🏠 jbbeacham.com | 📧 jbbeacham | 📺 james-beacham | 🐦 @jbbeacham

## Now

---

Post-doctoral researcher with Duke University (from October 2018), working on the ATLAS Experiment, based full-time at CERN

- Previously a post-doctoral researcher with Ohio State University (from June 2014 to October 2018), also full-time at CERN

## Education

---

### 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

---

**I search for physics beyond the Standard Model (BSM)**, currently with the ATLAS experiment at the LHC. Within ATLAS I focus on BSM long-lived particle (LLP), exotic decays of the Higgs boson, and non-standard photon signatures, having introduced multiple novel analyses to ATLAS that have led to publications. I'm currently leading and coordinating the search in ATLAS data for emerging jets, an LLP signature that could be evidence of dark QCD. I am a member of the CODEX-b collaboration, a proposed dedicated experiment for searching for LLPs that decay outside of the detector volume of the LHCb experiment at CERN.

**I founded the Long-Lived Particle Community initiative**, [ <https://cern.ch/longlivedparticles> ] in 2016, an independent, long-running workshop series and working group comprising ATLAS, CMS, and LHCb analyzers, theorists, and those working on FASER, MilliQan, MATHUSLA, CODEX-b, etc., as well as any LLP project worldwide. I coordinate its activities, including fourteen workshops, and was editor of a major paper that was published in the Journal of Physics G and garnered over 100 citations in a year, with more than 330 to date.

**I organize multiple other workshops and conferences** around the world, both on collider physics and related topics such as high-performance computing as it relates to public health concerns and initiatives.

**I lead hardware projects**: To ensure we don't miss discoveries in the upcoming high-luminosity era of the LHC, **I led a team that set up a test bench in support of the development of the data acquisition system for silicon strips for the ITk**, the upgrade of the ATLAS inner tracker, related work continuing to date.

**I have extensive computing/data preparation experience**, having served as prompt reconstruction coordinator for ATLAS data for 1.5 years.

**I'm engaged with future collider experiments such as the FCC and CEPC** and have been invited to participate in workshops and studies for such machines, as well as speak about LLP signatures in general at such projects and beyond.

Finally, **I'm a high-profile public keynote speaker / science communicator** [ <https://jbbeacham.com/outreach> ] who regularly speaks at events around the world.

## Leadership positions

---

**Founder/organizer** of the Long-Lived Particle Community, in 2016, an independent, long-running workshop series and working group comprising ATLAS, CMS, and LHCb analyzers, theorists, and those working on FASER, MilliQan, MATHUSLA, CODEX-b, etc., as well as any LLP-related project worldwide. I coordinate its activities, including fourteen workshops, and was editor of a major white paper that was published in the Journal of Physics G and garnered over 100 citations in a year, with over 330 to date. [Spring 2016 to present]

**Co-founder/organizer** of the FIPs workshop series, dedicated to feebly-interacting particles [2019 to present]

**Co-convener** of the Unconventional signatures and Exotic Higgs (UEH) sub-group of the Exotics research group in ATLAS, appointing in my first year as a post-doc [April 2015 - April 2016]

**Co-convener** of the LHC Long-Lived Particle Working Group (distinct from the LLP Community initiative, above), an organized working group of the LHC Physics Centre at CERN (LPCC) dedicated to determining the most important LLP-related issues for ATLAS, CMS, LHCb, MoEDAL, and FASER in the current short-term future [2020 – 2022]

**Coordinator** of FELIX-based hardware test bench at CERN for R&D with silicon strips for DAQ system for ATLAS ITk upgrade [October 2018 to 2020]

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

**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, appointed in my first year as a post-doc [October 2014 to November 2017]

## Selected papers

---

A complete list of my publications (over 500 of which are as an author with the ATLAS collaboration) can be found at <https://inspirehep.net/search?ln=en&p=beacham+james>. Additionally, a separate, more extensive, document of my publications is available upon request. Below is a selection of papers for which I was the or a primary contributor.

Not included here: Proceedings contributed in 2010 and 2012.

### LONG-LIVED PARTICLE COMMUNITY INITIATIVE

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

ARXIV:1903.04497

*J.Phys.G* 47 (2020) 9, 090501

September 2020

#### Long-lived particle signatures at the energy frontier

10.5281/ZENODO.4274125

*Snowmass 2021 Letter of Interest*

August 2020

### LHC LONG-LIVED PARTICLE WORKING GROUP

#### Review of opportunities for new long-lived particle triggers in Run 3 of the Large Hadron Collider [editor]

ARXIV:2110.14675

CERN-LPCC-2021-01

October 2021

### FUTURE COLLIDERS

#### A very high energy hadron collider on the Moon

ARXIV:2106.02048

*New J. Phys.* 24 023029

February 2022

### FEEBLY-INTERACTING PARTICLES (FIPs) WORKSHOP AND GROUP

#### Feebly-Interacting Particles: FIPs 2022 Workshop Report

ARXIV:2305.01715

*Accepted for publication in EPJC*

Submitted May 2023

#### Feebly-Interacting Particles: FIPs 2020 Workshop Report

ARXIV:2102.12143

*EPJC* 81 (2021) 11, 1015

February 2021

### PHYSICS BEYOND COLLIDERS GROUP

#### Physics Beyond Colliders at CERN: Beyond the Standard Model Working Group Report

ARXIV:1901.09966

*J.Phys.G* 47 (2020) 1, 010501

December 2019

### ATLAS — AS PRIMARY AUTHOR OR CORE CONTRIBUTOR

#### Search for emerging jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector in LHC Run 2

*In preparation*

Early 2024

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

ARXIV:1808.10515

*PRD* 99, 012008 (2019)

January 2019

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

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

ATL-DAQ-PUB-2018-001

March 2018

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

ARXIV:1606.03833

*JHEP*09 (2016) 001

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**

ARXIV:1509.05051

*EPJC* 76 (2016) 4, 210

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**

ARXIV:1509.08059

*PRD* 93, 052009

March 2016

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

ARXIV:1511.05542

*JHEP* 1602 (2016) 062

February 2016

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

ARXIV:1504.04188

*EPJC* (2015) 75:362

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**

ARXIV:1504.03634

*PRD* 92 (2015) 1, 012010

July 2015

**RD42**

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

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

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

*NIMA* 824 (2016) 402-405

July 2016

**APEX**

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

ARXIV:1108.2750

*Phys.Rev.Lett.* 107 (2011) 191804

2011

**ALEPH**

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

ARXIV:1003.0705

*JHEP* 1005 (2010) 049

2010

## Academic and research talks – selected

---

Not included here: Invited talks given remotely at international workshops and posters at workshops and conferences. For conferences and workshops I've organized (and usually given introductions at) see the "Professional Activities" section.

### ATLAS / LHC

#### **CODEX-b: A transverse detector for long-lived particles at the LHC**

PHYSICS BEYOND COLLIDERS ANNUAL WORKSHOP

*Virtual*  
*March 2021*

#### **Dark sector searches at the energy and accelerator frontiers: Near and far future**

SNOWMASS 2021 COMMUNITY PLANNING MEETING

*Virtual*  
*October 2020*

#### **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

#### **Experimental searches for long-lived particles: Where are the new discoveries in collider physics?**

INTERNATIONAL CONFERENCE ON HIGH ENERGY PARTICLE & ASTROPARTICLE PHYSICS (ICHEPAP2023)

*Kolkata, India*  
*Dec. 2023*

#### **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

*Worldwide*  
*2012-2015*

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

## ALEPH

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

RENCONTRES DE MORIOND: QCD AND HIGH ENERGY INTERACTIONS

*La Thuile, Italy*

*March 2010*

## SEMINARS

### **Where are the new discoveries at the Large Hadron Collider? Long-lived particles and searching for new physics at CERN and beyond**

DEPARTMENTAL SEMINAR

*Texas A&M University, Florida  
Institute of Technology, Southern  
Methodist University*

*2021-present*

### **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*

### **Avant-garde LHC: Inspiring the ATLAS detector to find physics it wasn't designed to find**

DEPARTMENTAL SEMINARS

Multiple seminars on this topic presented at universities and laboratories worldwide

*Michigan State, Birmingham,  
Michigan, SLAC, Manchester, Oxford,  
UIUC*

*2017-2019*

# Hardware and experimental operations

---

## ATLAS

### **Code reviewer for ATLAS reconstruction software**

CERN

*March 2023 to present*

- Reviewal of proposed changes to ATLAS reconstruction software, providing feedback, requests for modifications, and ultimately approval for readiness of inclusion into central ATLAS software

### **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. Currently participating in a more extensive setup for the same.

### **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

---

## PROGRAMS FOUNDED

### Founder of independent working group and workshop series dedicated to long-lived particles (LLPs)

CERN

THE LONG-LIVED PARTICLE COMMUNITY INITIATIVE

Early 2016 to present

- Initiator and founder, with members of the CMS, LHCb, and ATLAS experiments, as well as theorists and phenomenologists, of the 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 fourteen workshops, an egroup with nearly 300 members, and a community white paper, made public in March of 2019 and subsequently published in the Journal of Physics G, charting a course for LLP searches in the future, of which I am one of two editors, along with theorist Brian Shuve; the white paper garnered more than 100 citations in about a year, with more than 330 to date. More information: <https://cern.ch/longlivedparticles>

## WORKSHOPS AND CONFERENCES ORGANIZED

### Core workshop organizer

CERN; ICTP, Trieste, Italy; CERN;  
Nikhef, Amsterdam, Netherlands;  
CERN; Ghent, Belgium; Virtually  
April and October 2017; May and October  
2018; May and November 2019; May and  
November 2020; May and November  
2021; May-June and October-November  
2022; June 2023

SEARCHING FOR LONG-LIVED PARTICLES AT THE LHC AND BEYOND: {FIRST THROUGH THIRTEENTH} WORKSHOP(S) OF THE LLP COMMUNITY

- Core organizer of thirteen major workshops of the LLP Community initiative, 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 FASER, MilliQan, MoEDAL, SHiP, MATHUSLA, CODEX-b, ANUBIS, and more generally any experiment or project searching for LLPs around the world, such as fixed-target projects, beam-dumps, dark matter experiments, and future facilities such as the FCC, CEPC, CLIC/ILC. etc. — more information here: <https://longlivedparticles.web.cern.ch/node/26>

### Organizer and host

Virtual and at CERN

EXAHEALTH 2021: EXASCALE COMPUTING AND MACHINE LEARNING FOR PUBLIC HEALTH

October 2021

- Core organizer, in conjunction with Chelonia Applied Science and CERN openlab, and host of a workshop exploring how exascale / high-performance computing and machine learning are used in the service of public health. More informatio here: [https://indico.cern.ch/e/ExaHealth\\_2021](https://indico.cern.ch/e/ExaHealth_2021)

### Core workshop organizer

Virtually and at CERN

FIPS 2020 AND 2022: WORKSHOPS ON FEEBLY-INTERACTING PARTICLES

September 2020 and October 2022

- Core organizer of two multi-disciplinary workshops devoted to searches for feebly-interacting particles (FIPs) – particles with very small coupling to the Standard Model – around the world. The workshops had 200-300 registrants and were well-received by CERN leadership.

### 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

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

February 2016

SECTOR SIGNALS

## SUMMER STUDENT MENTORSHIP

### Supervisor of summer students

CERN

RESEARCH EXPERIENCE FOR UNDERGRADUATES PROGRAM AT CERN

Summer 2019, 2020, 2021, 2022

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

### 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.

## Software

---

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

## Teaching

---

### Invited lecturer

DK-PI SUMMER SCHOOL

*Virtual (originally Vienna, Austria)*

*September 2020*

### Supervisor

SUMMER STUDENTS / INTERNS

CERN

*Summers of 2017 to present*

### Teaching Assistant

MULTIPLE COURSES

*New York University*

*2008 - 2010*



## Outreach / communication / public appearances

---

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

In addition to my research, I specialize in novel, high-impact engagement with non-specialists at popular events dedicated to science, technology, futurism, start-up culture, digital culture, entrepreneurship, design, and art/science 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 dozens of others.

I enjoy engaging with emerging scientists via novel social media and am a prominent personality on TikTok, with hundreds of thousands of followers, where my videos reach millions of people.

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 1.6 million times. I am regularly invited to appear on podcasts and radio shows, including NPR’s “Science Friday”; participate in documentaries on the BBC, Discovery, Smithsonian, and independent feature productions (such as 2019’s *Chasing Einstein*); and I’ve been featured in *The New York Times*, *Wired*, *Gizmodo*, *Science News*, and *India Today*, among others.

I maintain an artistic practice as a filmmaker, as well, and I have exhibited at major venues internationally. I received a degree in film / cinema before training as a physicist (I have separate bachelor’s degrees in film studies and physics/math). I’m frequently invited to events and to participate in projects exploring the intersection of art and science. I regularly collaborate with other artists, and my work has been displayed internationally. For example, in 2015 I launched a project called *Ex/Noise/CERN* [<https://exnoisecern.ch/>] in collaboration with CERN, 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.