



# Introduction to the LHC Open Data Workshop

KATE SHAW

UNIVERSITY OF SUSSEX & ICTP

African Conference on Fundamental and Applied Physics

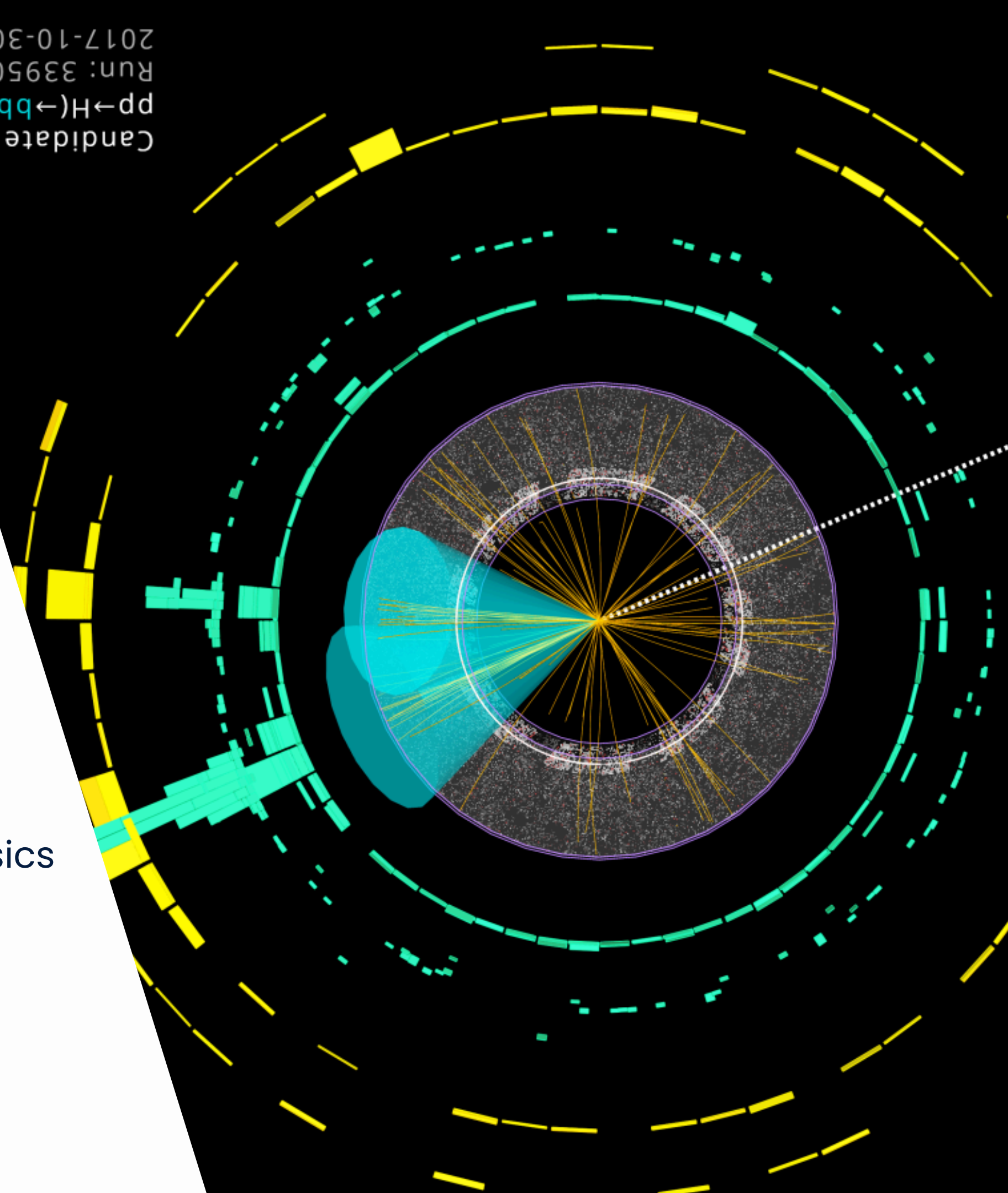
20 SEPTEMBER 2025



The Abdus Salam  
**International Centre  
for Theoretical Physics**  
Physics Without Frontiers

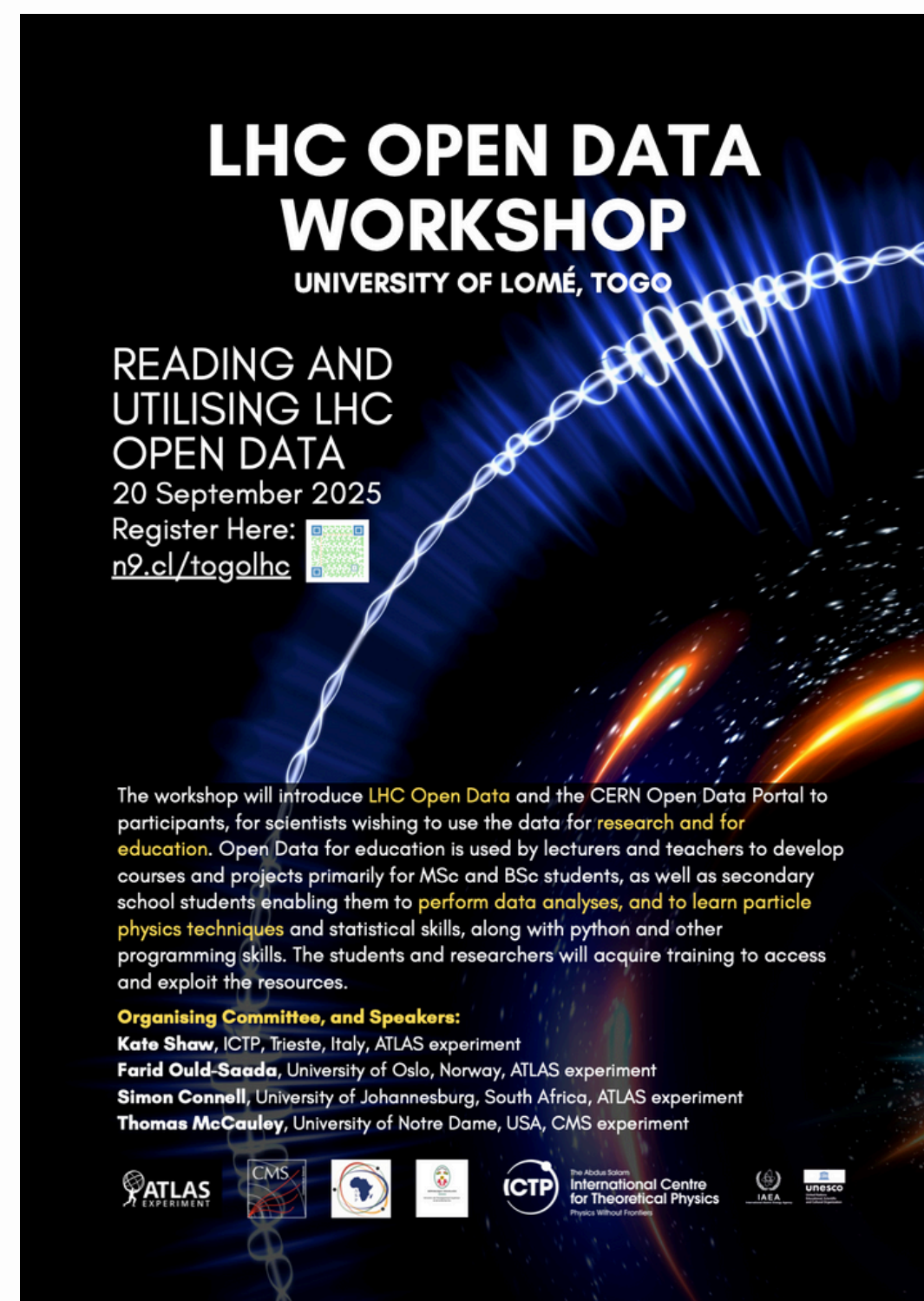


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2017-10-30 15:41:21





# LHC OPEN DATA WORKSHOP



**LHC OPEN DATA WORKSHOP**  
UNIVERSITY OF LOMÉ, TOGO

READING AND UTILISING LHC OPEN DATA  
20 September 2025  
Register Here: [n9.cl/togolhc](https://n9.cl/togolhc)

The workshop will introduce **LHC Open Data** and the CERN Open Data Portal to participants, for scientists wishing to use the data for **research and for education**. Open Data for education is used by lecturers and teachers to develop courses and projects primarily for MSc and BSc students, as well as secondary school students enabling them to **perform data analyses, and to learn particle physics techniques** and statistical skills, along with python and other programming skills. The students and researchers will acquire training to access and exploit the resources.

**Organising Committee, and Speakers:**  
**Kate Shaw**, ICTP, Trieste, Italy, ATLAS experiment  
**Farid Ould-Saada**, University of Oslo, Norway, ATLAS experiment  
**Simon Connell**, University of Johannesburg, South Africa, ATLAS experiment  
**Thomas McCauley**, University of Notre Dame, USA, CMS experiment

Logos: ATLAS EXPERIMENT, CMS, University of Lomé, ICTP, IAEA, UNESCO



**TOM MCCAULEY (EN)**  
UNIVERSITY OF NOTRE DAME  
CMS EXPERIMENT  
OPEN DATA CO-COORDINATOR  
FOR CMS 2024-PRESENT



**FARID OULD-SAADA (FR)**  
OLSO UNIVERSITY  
ATLAS EXPERIMENT  
ATLAS OPEN DATA DEVELOPER



**KATE SHAW (EN)**  
ICTP & UNIVETSITY OF SUSSEX  
ATLAS EXPERIMENT  
OPEN DATA COORDINATOR FOR  
ATLAS 2014-2025



TODAY we intend to provide you training on how to access and use the LHC Open Data from the ATLAS experiment and the CMS experiment

# LHC OPEN DATA WORKSHOP

<https://indico.ictp.it/event/11099/other-view?view=ictp timetable>

ZOOM Connection: <https://indico.cern.ch/event/1458227/videoconference/>

Saturday, 20 September 2025

14:00 - 14:10	Introduction to the LHC Open Data Workshop Convener: Dr. Kate Shaw (ICTP) Material:  Introduction to Workshop	▼
14:10 - 14:35	CERN Open Data Portal Convener: Pablo Saiz (CERN)	▼
14:35 - 15:00	ATLAS Open Data Tutorial Convener: Dr. Kate Shaw (ICTP)	▼
15:00 - 15:25	CMS Open Data Tutorial Convener: Dr. Thomas McCauley (University of Notre Dame)	▼
15:25 - 15:45	Break	▼
15:45 - 17:15	Hands-on Analysis, H-> ZZ-> llll Convener: Prof. Farid Ould-Saada (University of Oslo)	▼
17:15 - 17:25	How to Documentation	▼
17:25 - 17:30	Certificates and Close Material:  Evaluation Form	▼

All materials and links can be found on the ICTP [indico](#) page for the workshop

**The session will be in French and English**

PLEASE ask plenty of questions in French or English (online use the zoom chat)

**Please follow along, and we will come around to help you, raise your hand if you need help.**

[\*\*LINK TO TOM CMS TALK\*\*](#)

[\*\*LINK TO FARID ATLAS TALK\*\*](#)



# Open Science Movement



Open science is an **accelerator** for the **Sustainable Development Goals (SDGs) 2030** and a powerful tool to bridge the science divide between and within countries

**Open science** aims at making scientific knowledge openly **available, accessible** and **reusable**.

The key elements include open access to scientific publications, **data**, educational resources, software and hardware, and open infrastructures

# CERN OPEN DATA PORTAL

Datasets available for Research, and for Education

opendata  
CERN

Help ▾ About ▾

Explore more than **five petabytes**  
of open data from particle physics!

Search

search examples: [collision datasets](#), [keywords:education](#), [energy:7TeV](#)

Explore

[datasets](#)  
[software](#)  
[environments](#)  
[documentation](#)

Focus on

[ALICE](#)  
[ATLAS](#)  
[CMS](#)  
[DELPHI](#)  
[LHCb](#)  
[OPERA](#)  
[PHENIX](#)  
[TOTEM](#)  
[Data Science](#)

ATLAS  $\sqrt{s}$  simulation for ML-based jet flavour tagging (JetSet)

Flavour-tagging — the task of identifying the flavour of jets — is essential for many physics analyses at the ATLAS train and evalu...

[Dataset](#) [Derived](#) [Simulated](#) [ATLAS](#)

ATLAS releases first open data from heavy-ion collisions

The ATLAS Collaboration has released its first open data of heavy-ion collisions for research purposes. This data is a nucleon pair, recorded in 2015 as part of the Large Hadron Collider's second operation period (LHC Run 2).

[News](#) [ATLAS](#)

ATLAS releases 65 TB of open data for research

Explore over 75 billion LHC collision events — from home

[News](#) [ATLAS](#)

ATLAS DAOD\_HION14 format Run 2 2015 Pb-Pb MC simulation

Run 2 2015 Pb-Pb MC simulation from the ATLAS experiment

[Dataset](#) [Simulated](#) [Heavy-Ion Physics](#) [ATLAS](#)

ATLAS DAOD\_HION14 format Run 2 2015 Pb-Pb collision data

Run 2 2015 Pb-Pb collision data from the ATLAS experiment

[Dataset](#) [Collision](#) [ATLAS](#)

DAOD\_HION14 format 2015 Pb-Pb Open Data for Research from the ATLAS experiment

2015 Pb-Pb Open Data for Research from the ATLAS experiment

[Dataset](#) [Simulated](#) [Collision](#) [Heavy-Ion Physics](#) [ATLAS](#)

ATLAS top tagging open data set with systematic uncertainties

Boosted top tagging is an essential binary classification task for experiments at the Large Hadron Collider (LHC). The Open Data Set is...

[Dataset](#) [Derived](#) [Simulated](#) [ATLAS](#)

DAOD\_PHYSLITE format 2015-2016 Open Data for Research from the ATLAS experiment

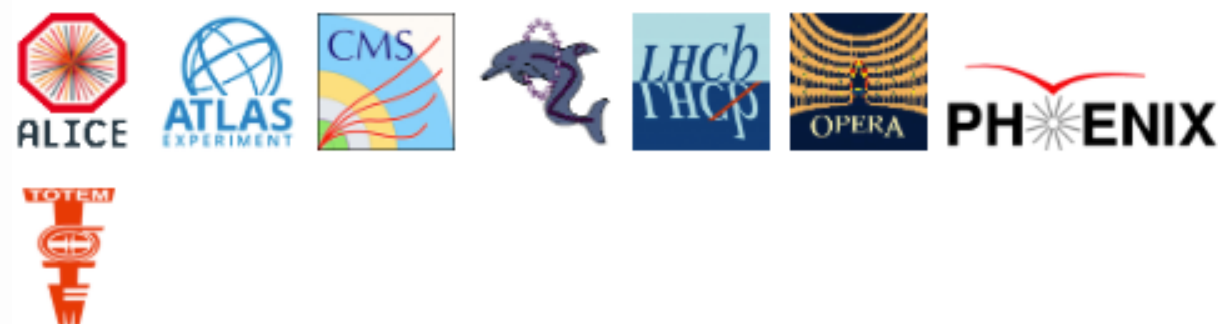
2015-2016 Open Data for Research from the ATLAS experiment

[Dataset](#) [Simulated](#) [Collision](#) [ATLAS](#)

ATLAS DAOD\_PHYSLITE format MC simulation top systematic variation samples

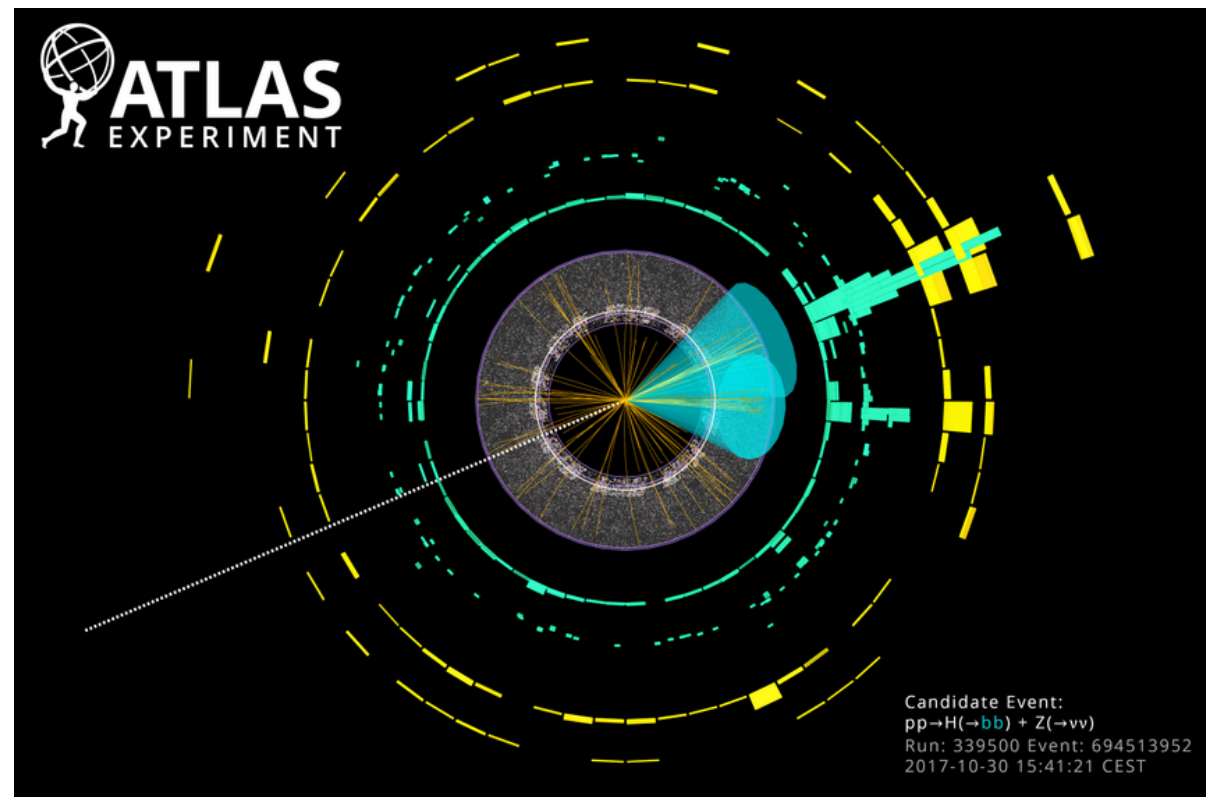
MC simulation top systematic variation samples from the ATLAS experiment

[Dataset](#) [Simulated](#) [Standard Model Physics](#) [Top physics](#) [ATLAS](#)



<https://opendata.cern>

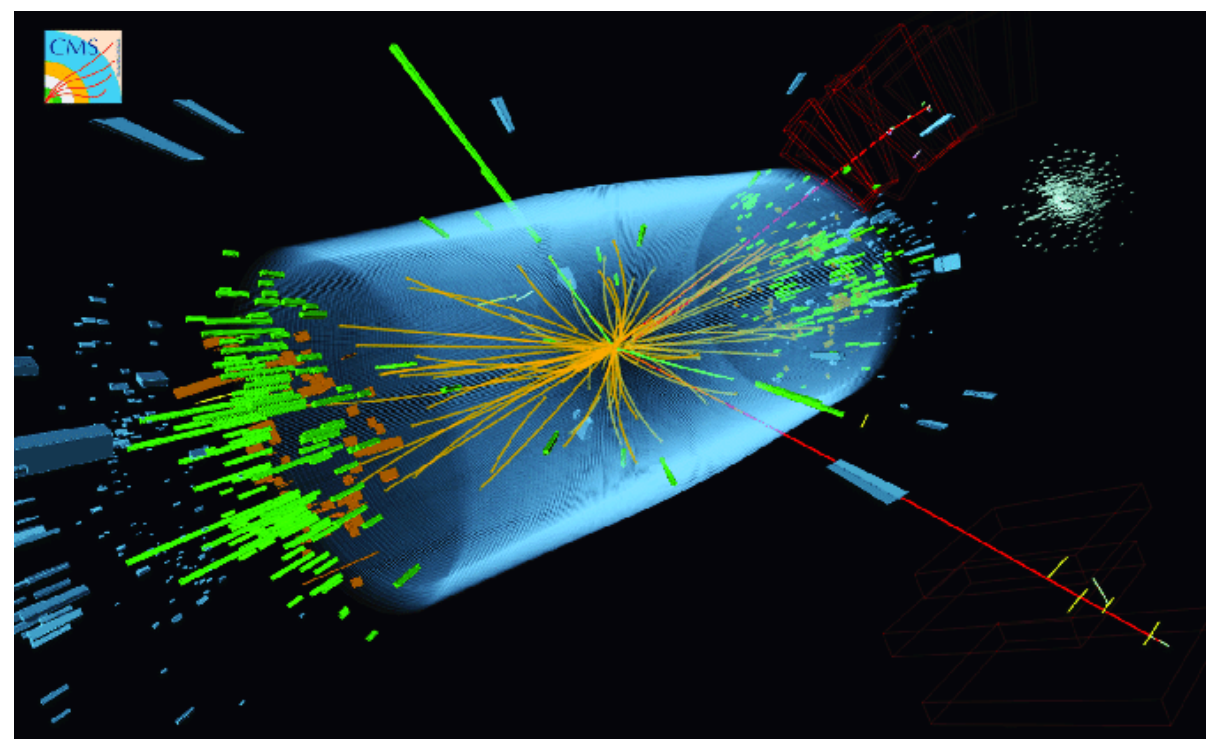
# OPEN DATA: WHAT IS IT?



Each proton proton collision creates some particles, heavy ones decay into lighter particles.

Everything flies out for the centre of the collision into ATLAS / CMS detector

The particles interact with the detectors, and our reconstruction algorithms get to work to **reconstruct** 'objects' such as electrons, muons, taus, jets missing ET, photons.



**The NTUPLE has information such as:**

- number of objects (jets, electrons, muons)
- Transverse momentum (PT) for each object
- Where the object is, in Phi and eta
- Amount of Missing Energy (GeV)



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