What can ATLAS bring to EPS ?

ORIGIN-Puebla
Exhibit posters caption

21-24 May 2019

+ ATLAS experiment, data & collaboration

CERN

1.8 x 1.8 m

Mor

https://home.cern

@CERN

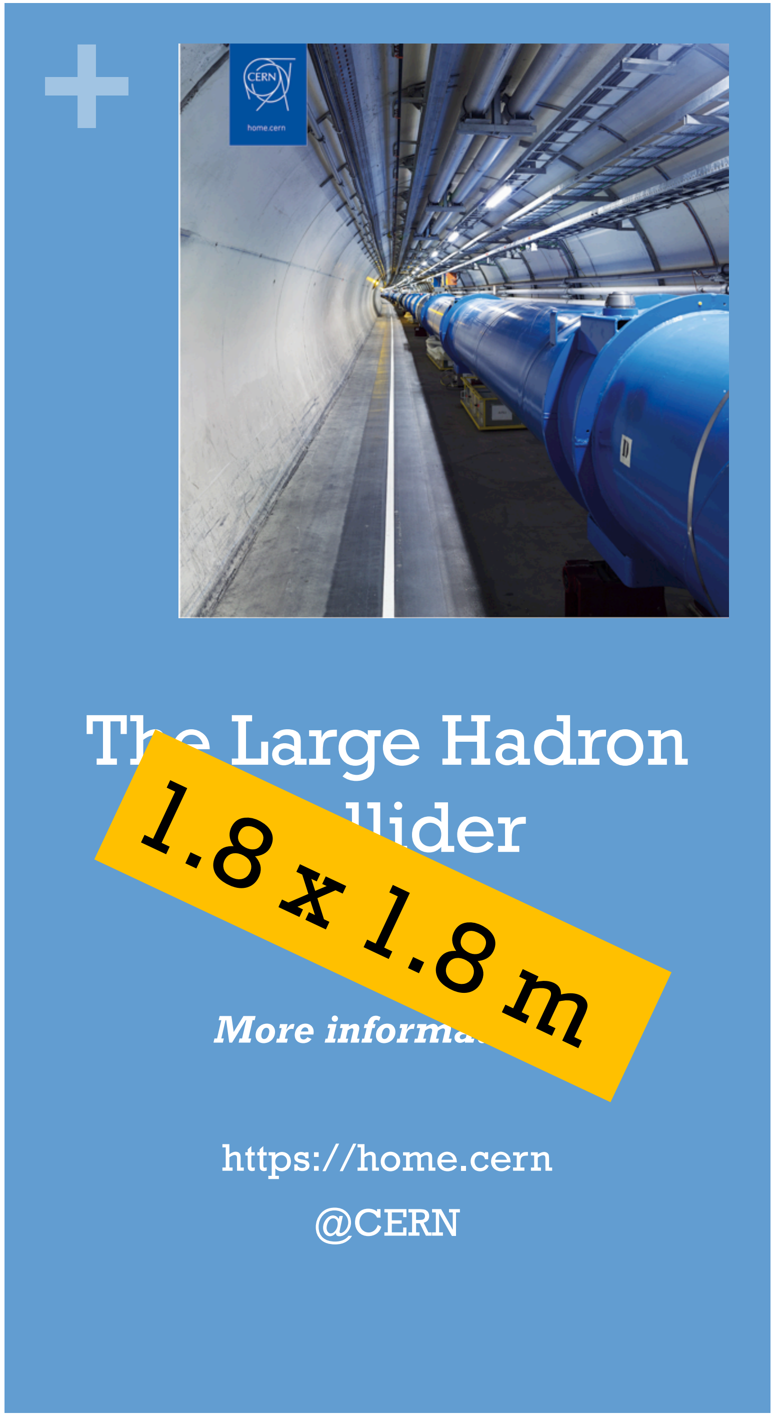
What is the nature of our universe ? What is it made of ?

Scientists seek answers to such fundamental questions by using particle accelerators and pushing the limits of technology.

Founded in 1954, the CERN laboratory sits astride the Franco-Swiss border near Geneva. It is run by 23 Member States, employs 2500 people and hosts experiments built and run by about 15000 scientists from all around the world.

Key achievements:

- The Higgs Boson
- The Large Hadron Collider
- The birth of the web
- Antimatter



The Large Hadron Collider (LHC) is the world's largest and most powerful particle accelerator. It first started up in September 2008, and remains the latest addition to CERN's accelerator complex.

Inside the accelerator, two high-energy particle beams travel in opposite directions, at close to the speed of light, before they are made to collide.

These beams are guided in the 27km long LHC ring by a strong magnetic field, maintained by 15 meter long superconducting dipole magnets.

Thousands of magnets of different varieties and sizes are used to "squeeze" the particles closer together and increase the chances of collisions in 4 interaction points.

The ATLAS detector

1 x 1 m

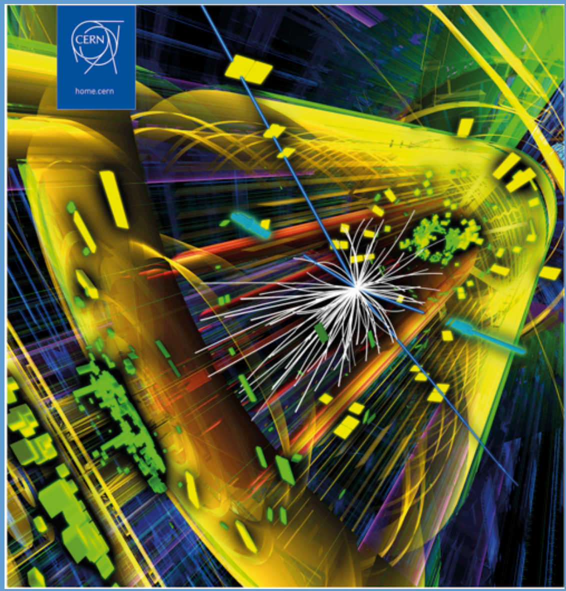
http://atlas.c

@ATLASexperiment

The 46m long and 25m wide ATLAS detector is designed to exploit the full discovery potential and huge range of physics opportunities that LHC provides.

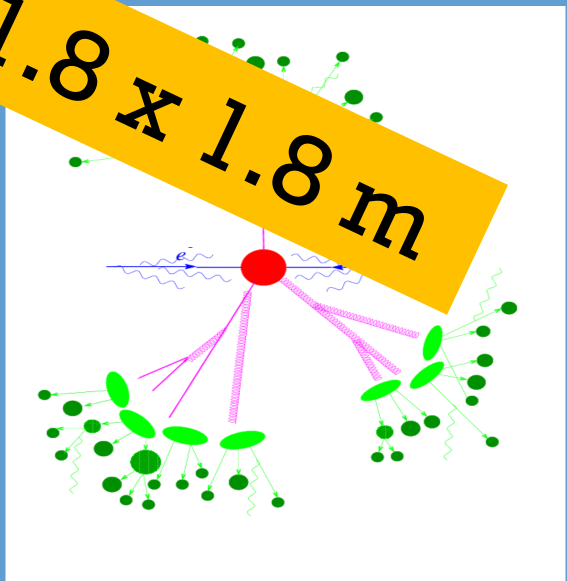
The experiment is run by an international collaboration of about 3000 scientific authors from 183 institutions around the world, representing 38 countries. About 1200 doctoral students are involved in detector development, data collection and analysis.

From the gigantic Muon System "big wheels" to the silicon sensors installed close to the beam, the detector operation and data quality depend on countless engineers, technicians and administrative staff.



Proton Collisions

1.8 x 1.8 m

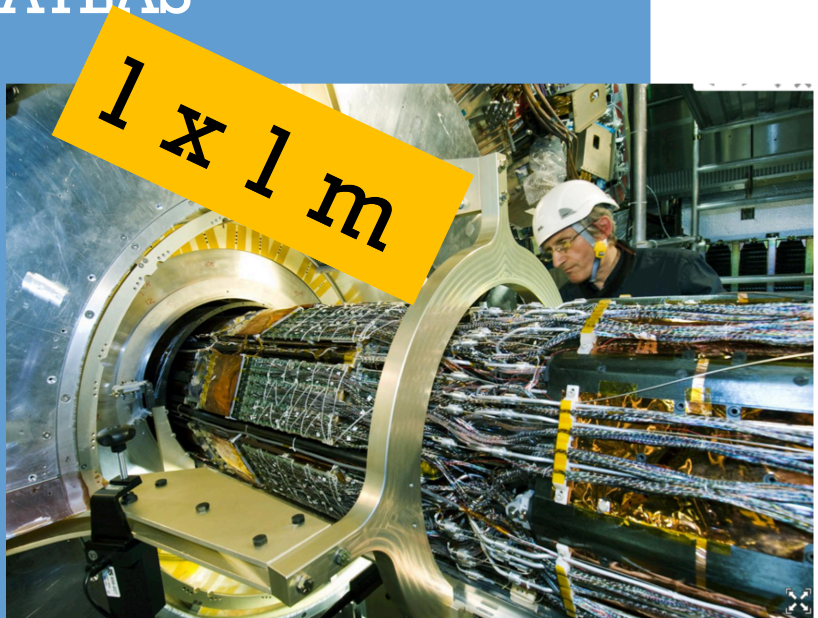


Just as hunters can identify animals from tracks in mud or snow, physicists identify subatomic particles from the traces they leave in detectors.

Modern particle detectors consist of layers of sub-detectors, each designed to look for particular properties or specific types of particle. Tracking devices reveal the path of a particle; calorimeters stop, absorb and measure a particle's energy; and particle-identification detectors use a range of techniques to pin down a particle's identity.

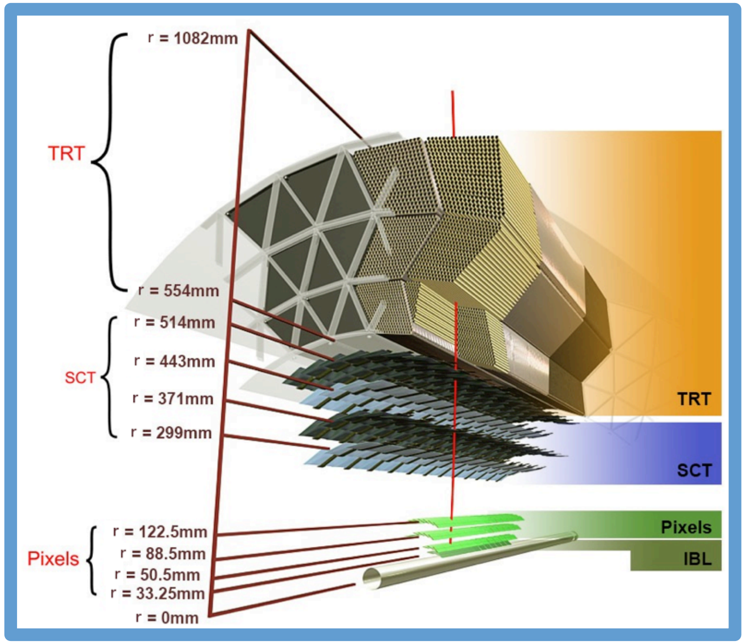
Collating all these clues from different parts of the detector, physicists build up a snapshot of what was in the detector at the moment of a collision. The next step is to scour the collisions for unusual particles, or for results that do not fit current theories

In the very inner core of ATLAS

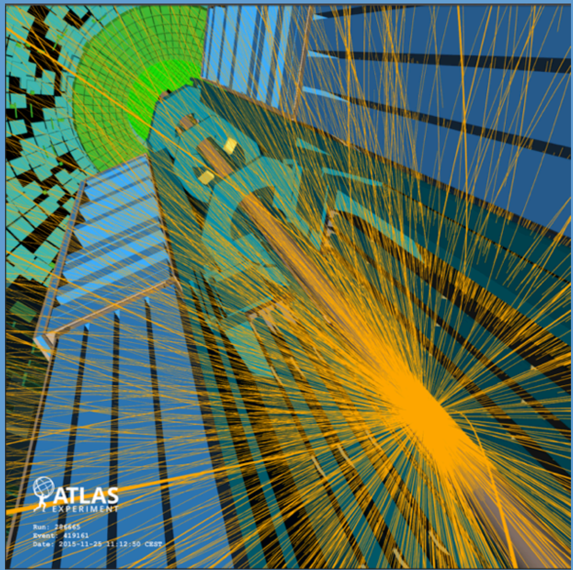


One of the early collision events with stable beams recorded by ATLAS on 23 April 2016. The picture shows the region where the two beams from the LHC collide, at the very inner core of the ATLAS detector. In this event the colliding protons give birth to ten primary interactions, as shown in the picture.

The beam pipe (in grey) surrounded by the first layers of the Pixel detector (in blue). The white spheres locate the primary vertices, where the interactions between the colliding particles happened. The reconstructed tracks of the particles produced in those interactions and with transverse momentum above 1GeV are drawn in yellow

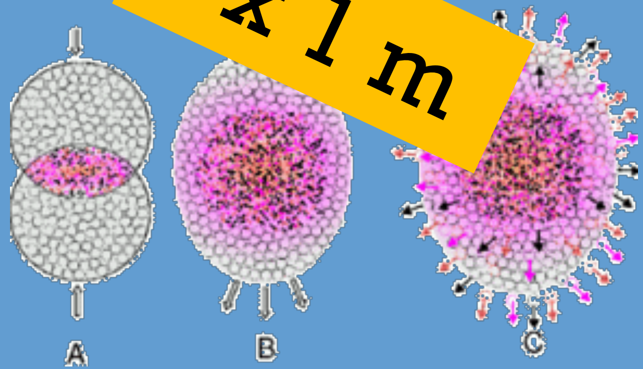


+



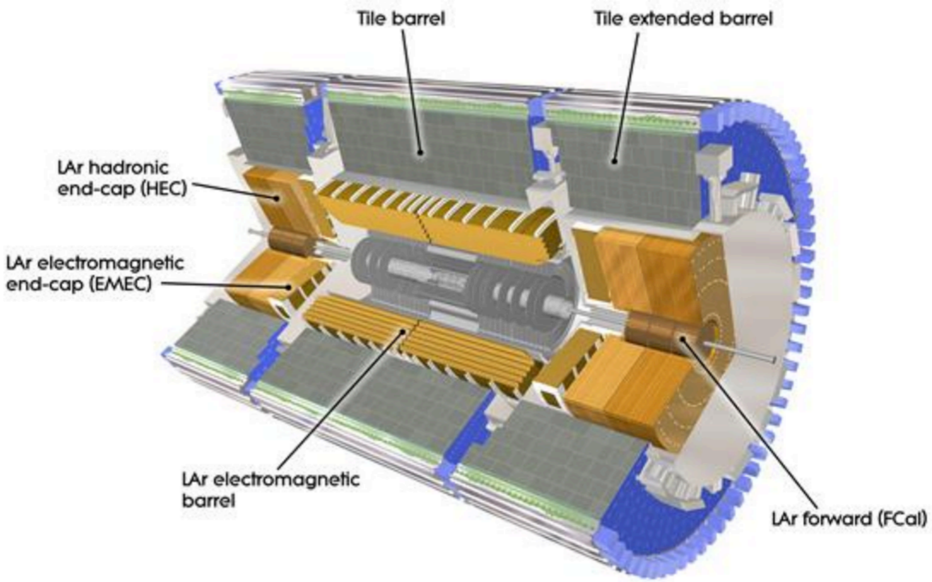
Heavy ion collisions

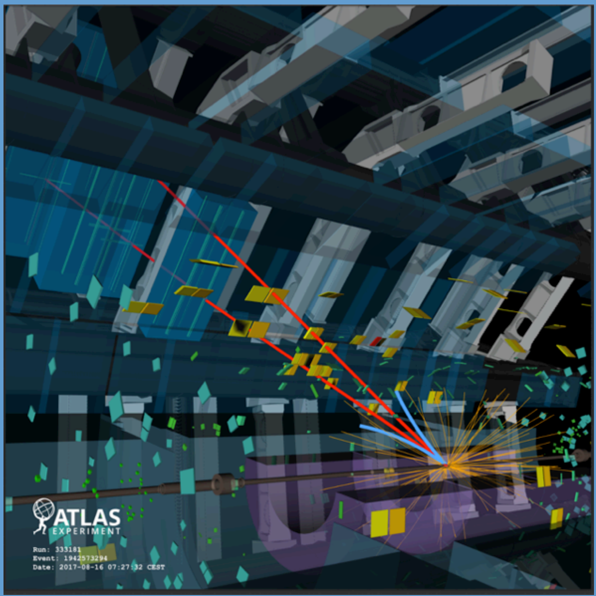
1 x 1 m



One of the first heavy-ion collisions with stable beams recorded by ATLAS in November 2015.

Tracks reconstructed from hits in the inner tracking detector are shown as orange arcs curving in the solenoïdal magnetic field. The green pads indicate energy deposits in the Liquid Argon and Scintillating Tile calorimeters. The beam pipe and the inner detectors are also shown.





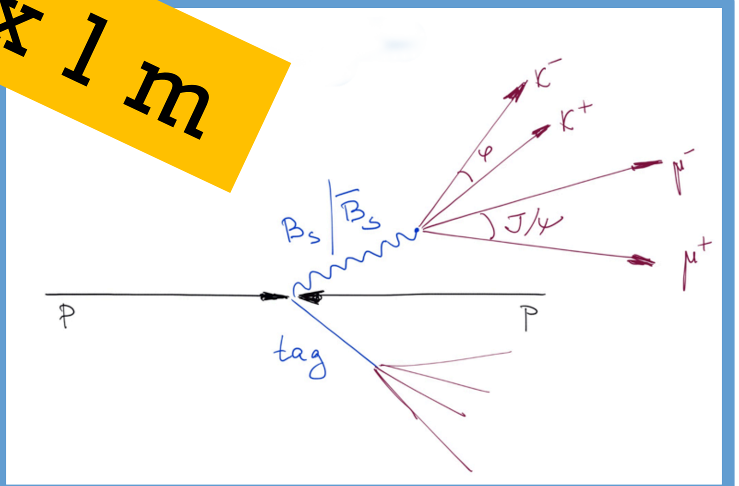
Bs decay in the ATLAS detector

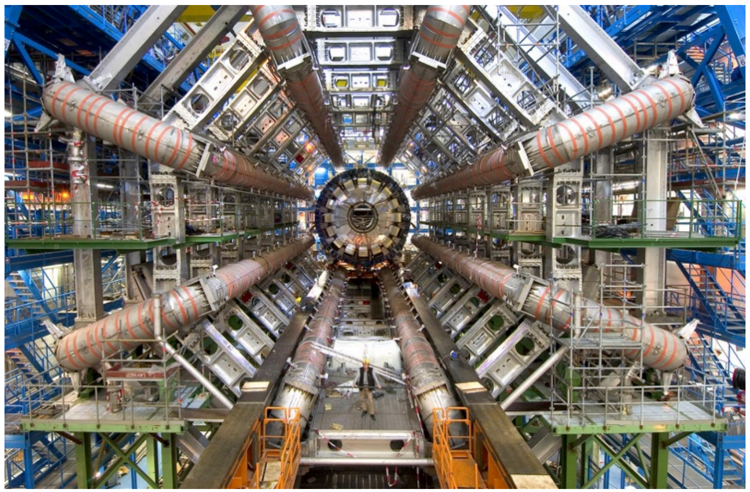
1 x 1 m

A Bs candidate(meson made of a b and s quark and anti-quark) decaying into a J/psi (pair of c quark and anti-quark) and a phi (pair of s quark and anti-quark). The J/psi decays to two opposite-charge muons (red lines) and the phi decays into two opposite-charge kaons (blue).

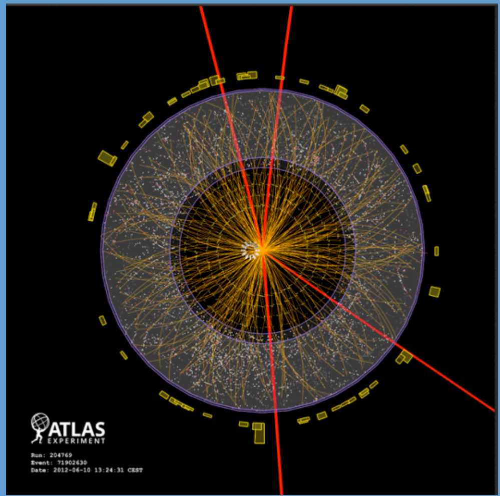
The event was recorded by ATLAS on 16 Aug 2017 and featured in the 2019 winter conferences [ATLAS CONF 2019-009 note, CERN news 02/04/2019].

The reconstructed tracks of the particles produced in those interactions and with transverse momentum above 1GeV are drawn in yellow. Orange and green pads indicate energy deposits in the calorimeters. The ATLAS toroid magnet and muon detectors are also shown.





Higgs boson decay in the ATLAS detector



Higgs boson candidate: from the collision in the centre, the particle decays into four muons (red tracks)

This image was used in the first ATLAS and CMS collaborations combined measurement of the Higgs boson mass, in March 2015. "Collaboration is really a part of our organisation's DNA", commented CERN director general Rolf Heuer.

In 2015, each collaboration had found few hundred events in the Higgs to photons channel and a few tens in the Higgs leptons channel.

1 x 1 m

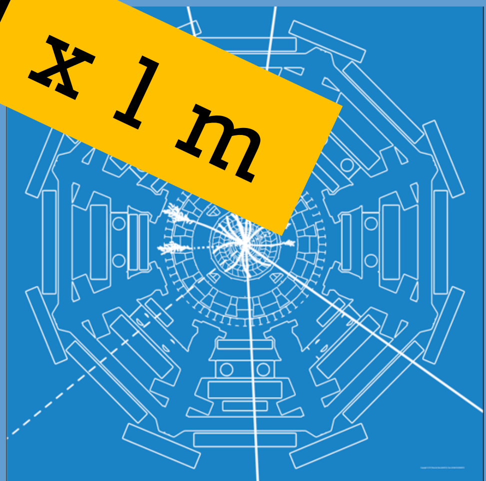


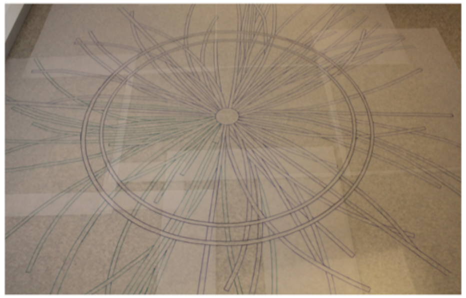
Illustration of the particle identification method used by the ATLAS physicists in the search for the Higgs boson. The detector elements shapes and relative proportions are extracted from the detailed geometry description used for events simulation and reconstruction. Examples of muon, electron, photon, proton, neutron and neutrino signatures are provided

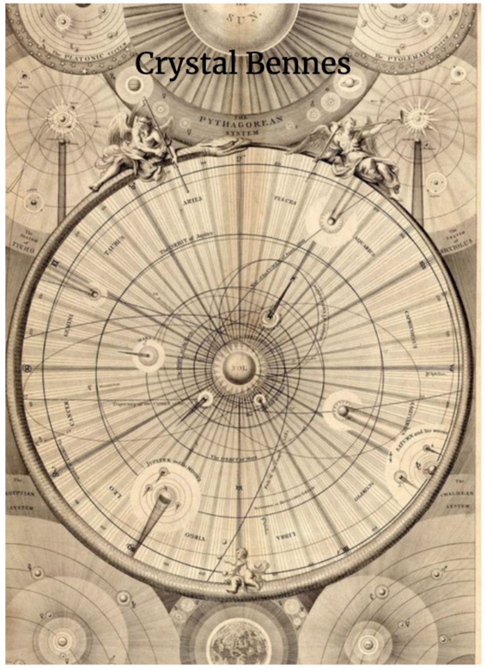
Inspired by the Higgs

Stained glass window

The discovery of the Higgs boson had a huge impact in the public, its properties are a constant source of wonder and inspiration.

Crystal Bennes is an artist, writer and researcher based in Edinburgh. She developed in 2014 a stained glass window where her interest for contemporary physics is combined with medieval studies. She visited ATLAS for the first time in 2018 and now explores through fine art practice data representation in particle physics.



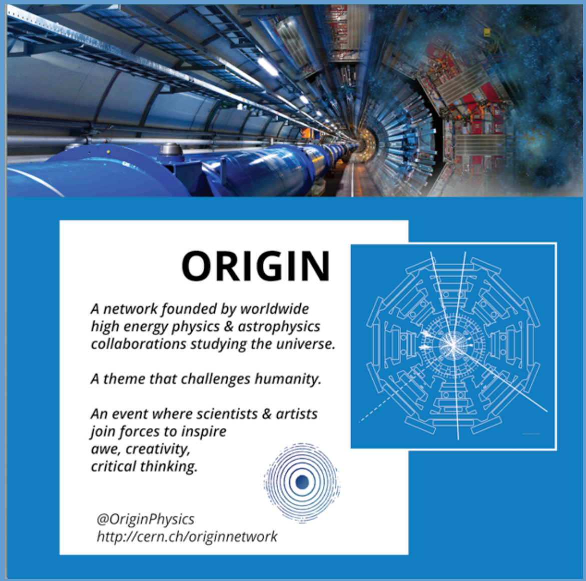


http://crystalbennes.com/portfolio/atlas-experiment-event-of-14-september-2014-in-stained-glass

1 x 1 m

- More about Higgs inspiration, using the Mexican art students pieces.

ORIGIN Credits & Partners



The ORIGIN physics twork

1 x 1 m

More in

http://cern.ch/originnetwork
@originphysics

ORIGIN was founded in January 2018 as a flexible and open network, which local experts and research centres can join and contribute to on a case by case basis.

Events are organised with collaboration institutes, art partners or alongside physics conferences. They can feature public talks, exhibits and interactions between scientists, artists and the public. They may integrate a strong educational component when schools & teachers are invited.

2018 activities: Toronto (Canada); Split (Croatia); Tbilisi (Georgia), Tokyo (Japan).

ATLAS EXPERIMENT
ICECUBE SOUTH POLE NEUTRINO OBSERVATORY
CMS Compact Muon Solenoid
Muographix
ALICE
LSC LIGO Scientific Collaboration
VIRGO
LHCb