Beamline for Schools

A physics competition for high-school students

Welcome to ATLAS!

beamline for schools

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CERN

DESY.

What will we do in the next hour?

Purpose and functional principle of ATLAS

Virtual visit of ATLAS

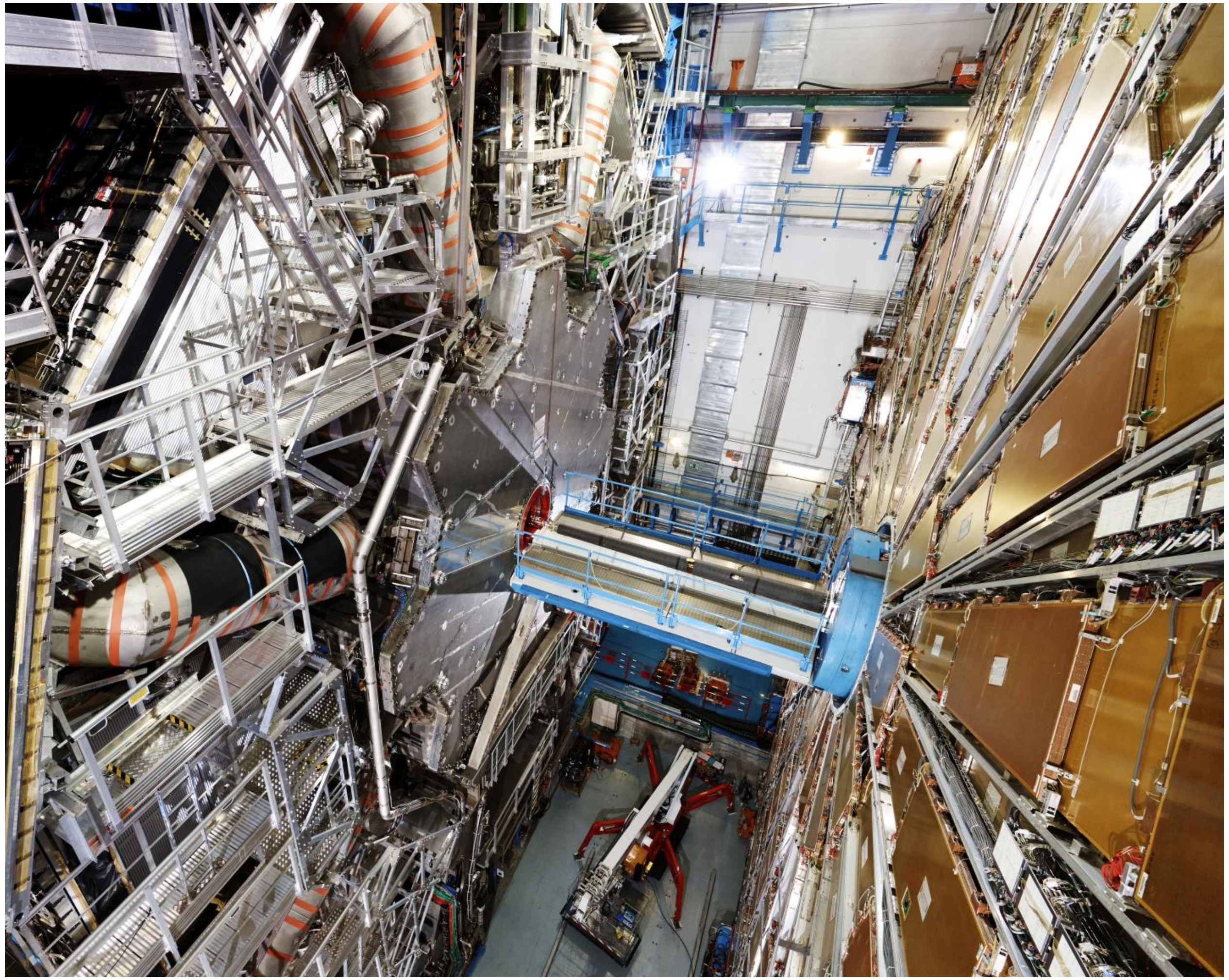
Q&A session

What is ATLAS?

ATLAS is one of the four particle detectors at the Large Hadron Collider

General-purpose particle detector

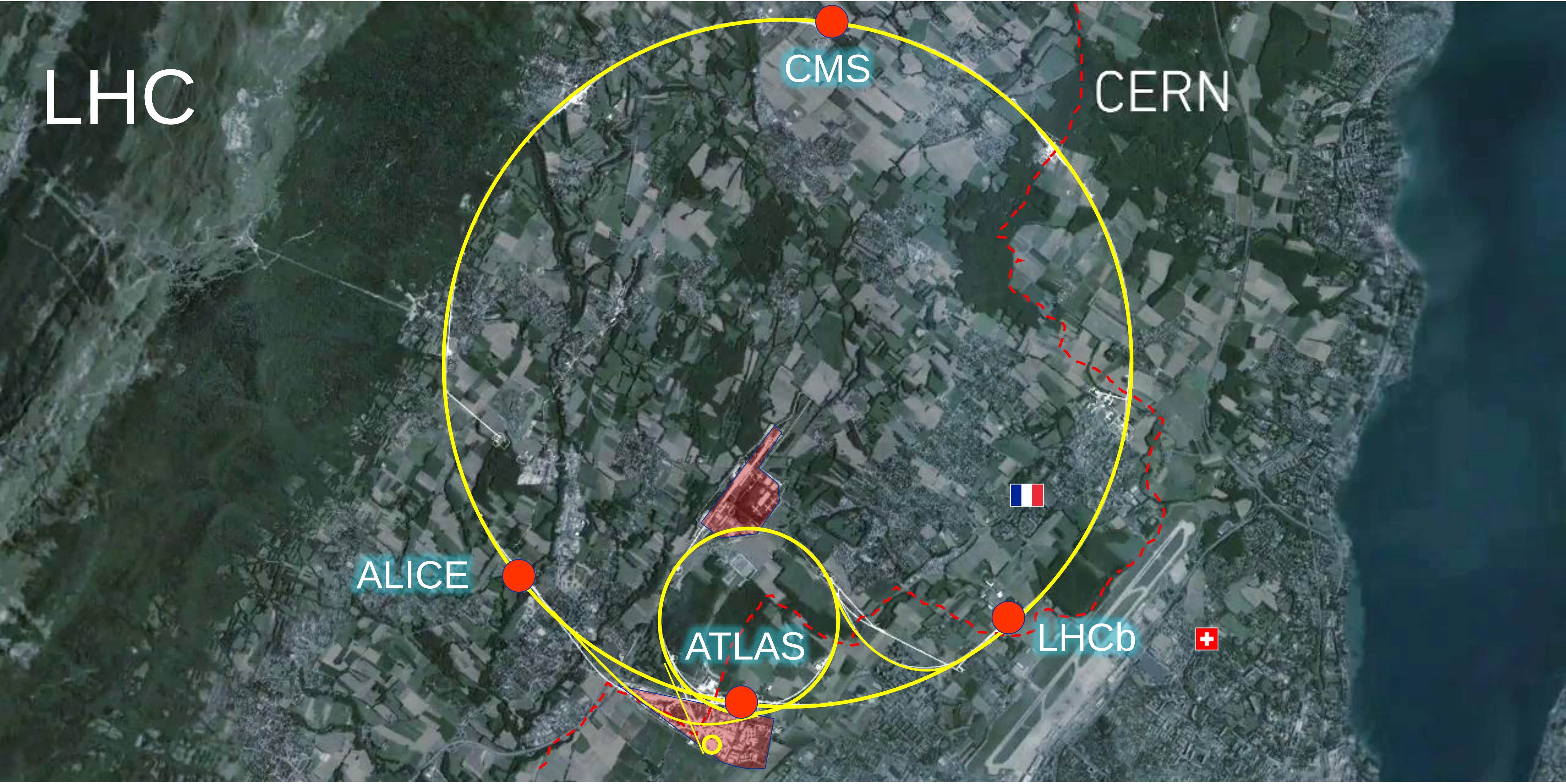
⇨ designed to **observe any new physics phenomena** that the LHC might reveal



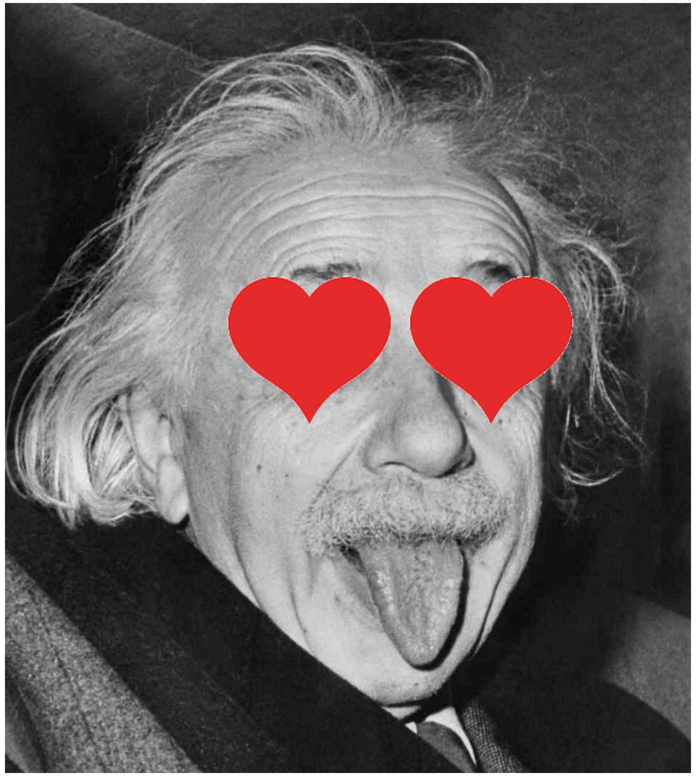
What is the LHC?

Large Hadron Collider (LHC)

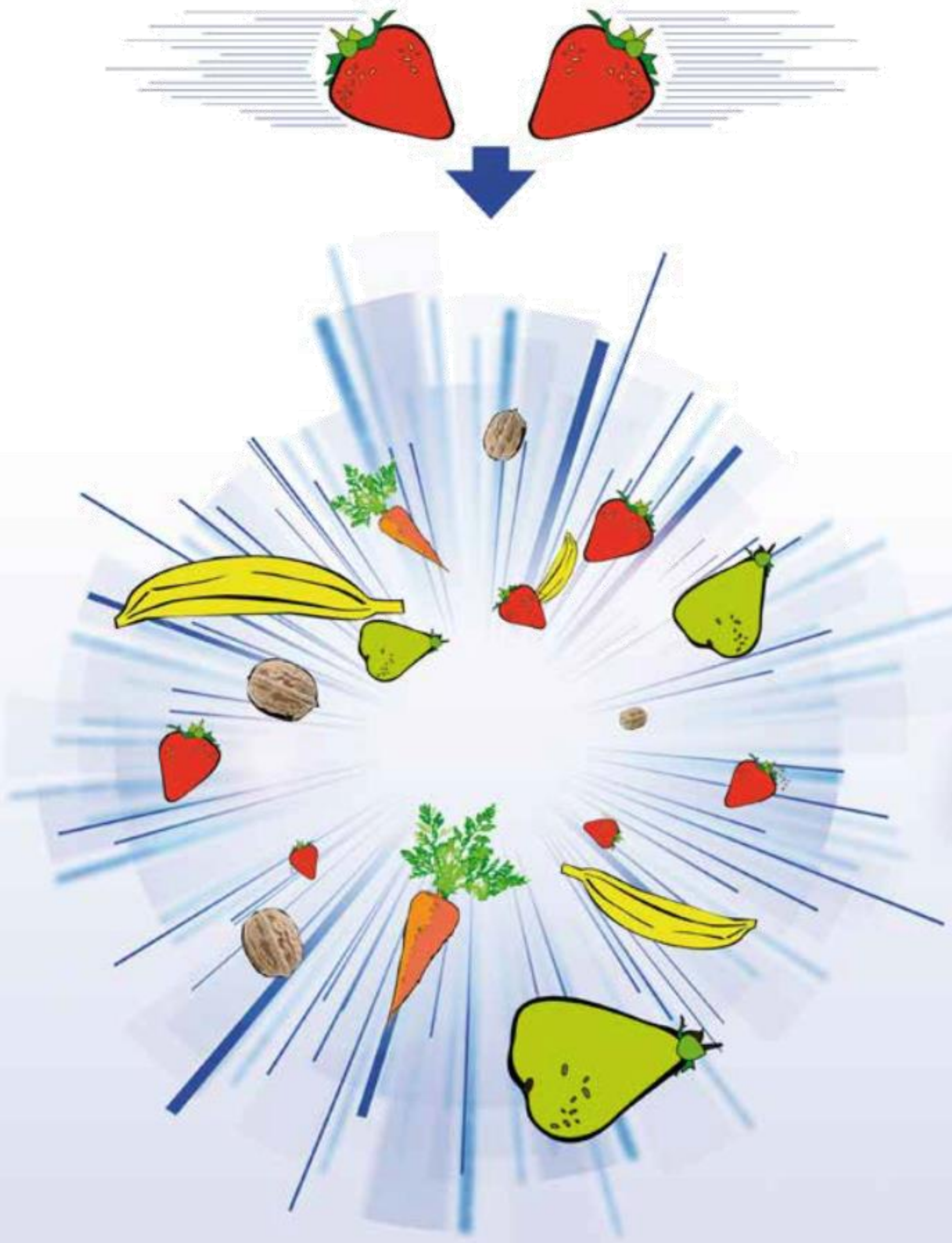
- 27-km long **particle accelerator**
- accelerates particles to nearly the speed of light in opposite directions and **brings these particles to collision** at four points
- accelerates protons or lead ions


LHC
CMS
CERN
ALICE
ATLAS
LHCb

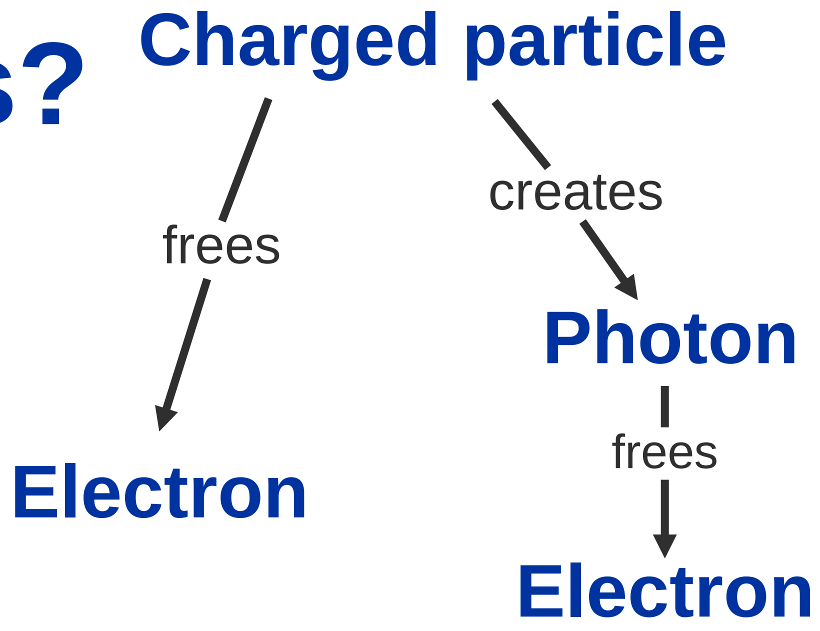
What happens in a particle collision?



$$E=mc^2$$



How can we detect particles?

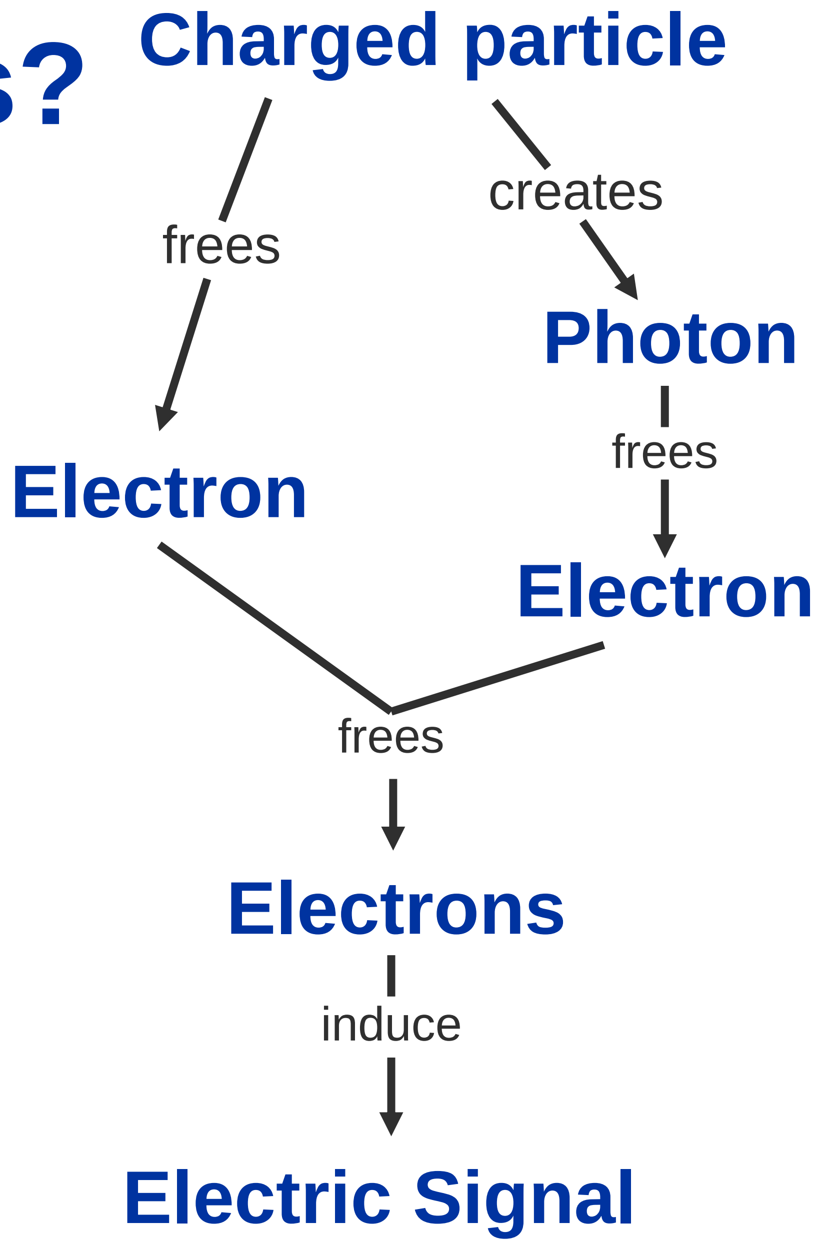


Electrically charged particle transfers some of its kinetic energy to the detector material

(1) Electrons are freed (e.g. ionisation)

(2) Photons are created (e.g. scintillation or Cherenkov) **that subsequently free electrons** (e.g. photoelectric effect)

How can we detect particles?



- **Avalanche effect:** the electron gains kinetic energy in an electric field and transfers kinetic energy to another electron, which is freed and so on …
- **Electrostatic induction:** when the electrons approach the read-out electrode, they induce an electric signal

How is ATLAS structured?

Each layer has its specific tasks:

1) **Tracking:** thanks to a magnetic field we can learn about the particles' **charge** and **momentum**
2) **Electromagnetic calorimeter:** measures the **energy** of all photons, electrons, and positrons
3) **Hadronic calorimeter:** measures the **energy** of all hadrons (e.g. protons, kaons, …)
4) **Muon spectrometer:** thanks to a magnetic field we can determine the muons' **charge** and **momentum**

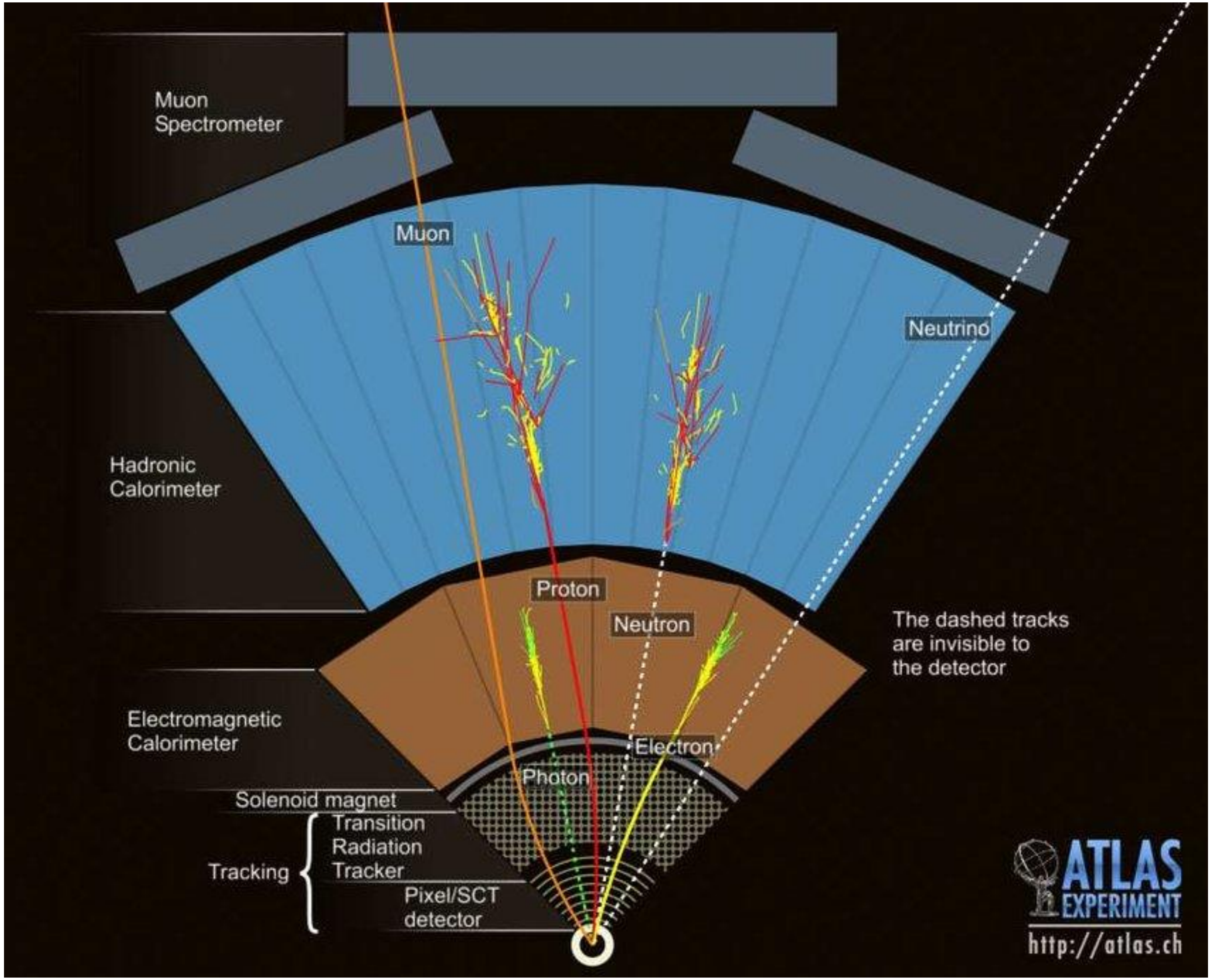
Particle tracks

Muon spectrometer

Hadronic calorimeter

Electromagnetic calorimeter

Tracking



Proposal submission

The submission is open.

Submission deadline:

April 10, 2025

It’s time to write your proposals!

Questions?