Beamline for Schools

A physics competition for high-school students

Welcome to ATLAS!

What will we do in the next hour?

Purpose and functional principle of ATLAS

Virtual visit of ATLAS

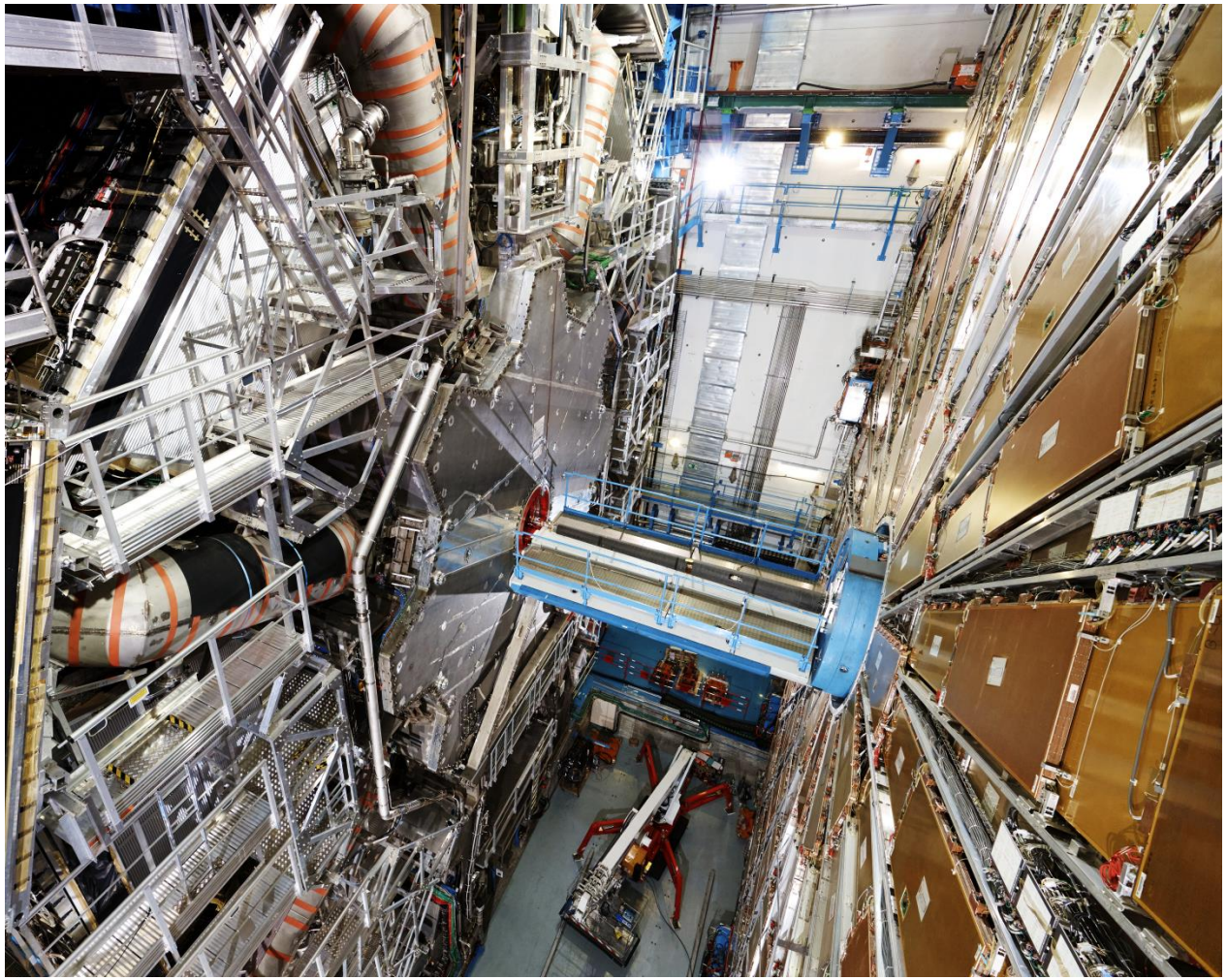
Q&A session

What is ATLAS?

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

General-purpose particle detector

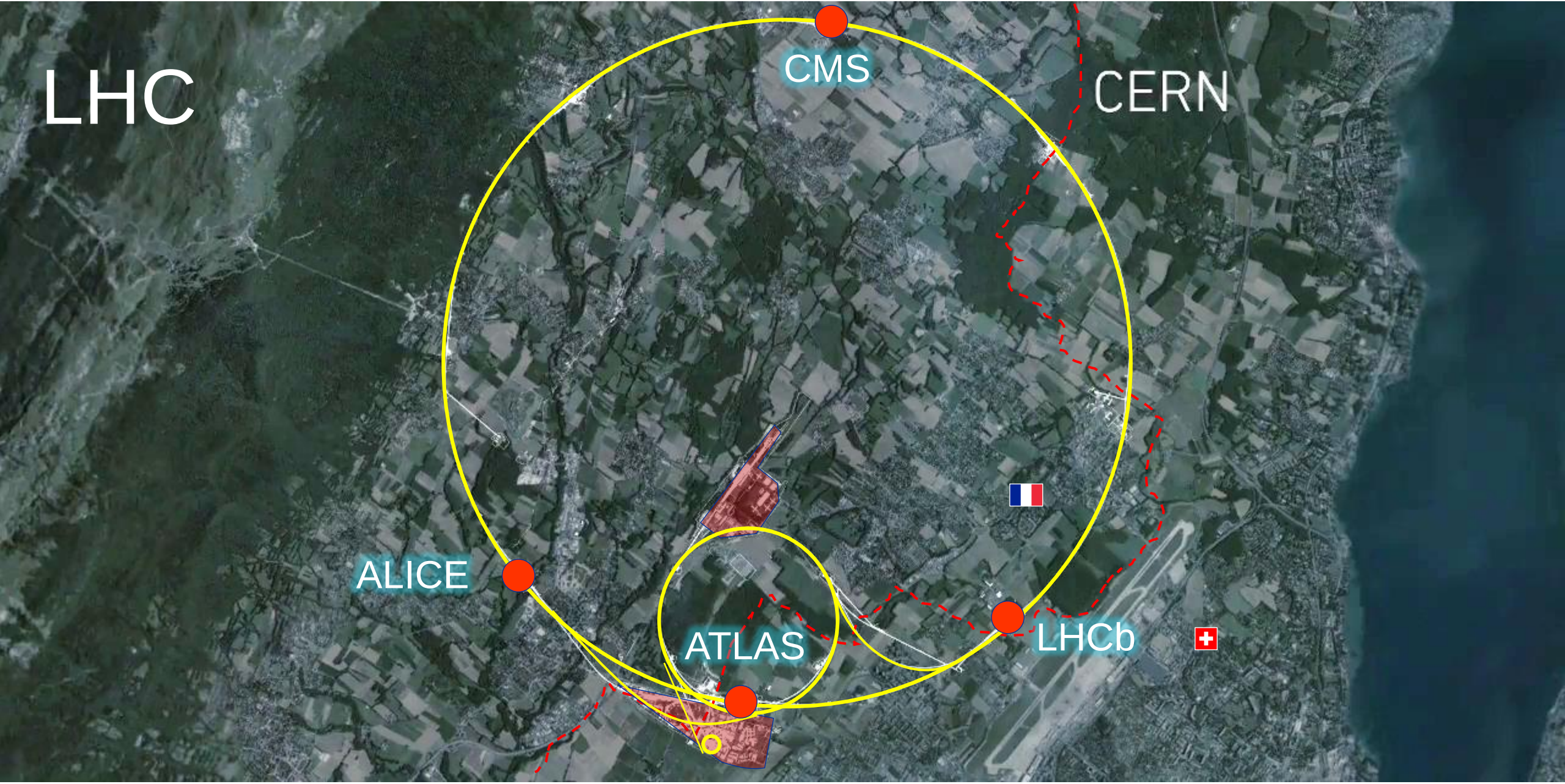
⇨ designed to **observe any new physics phenomena** that the LHC might reveal



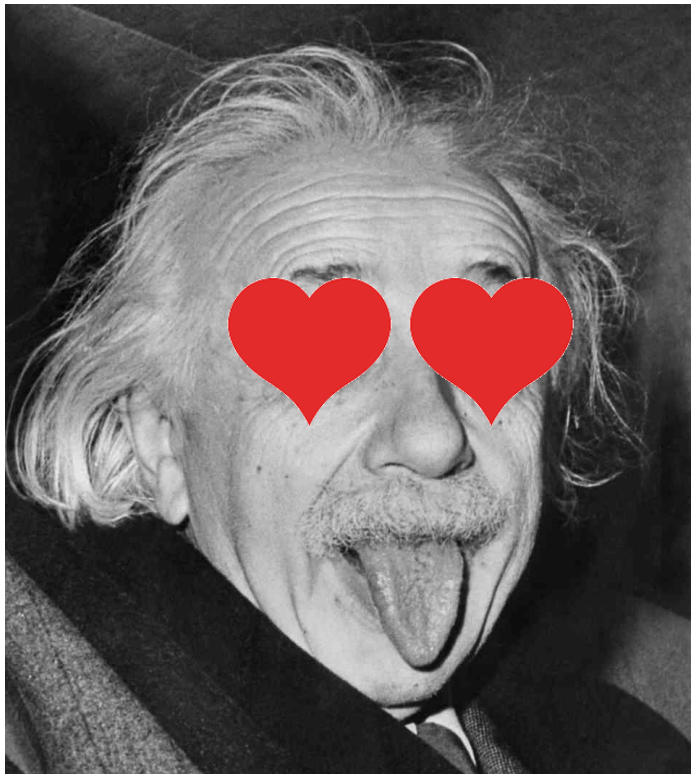
What is the LHC?

Large Hadron Collider (LHC)

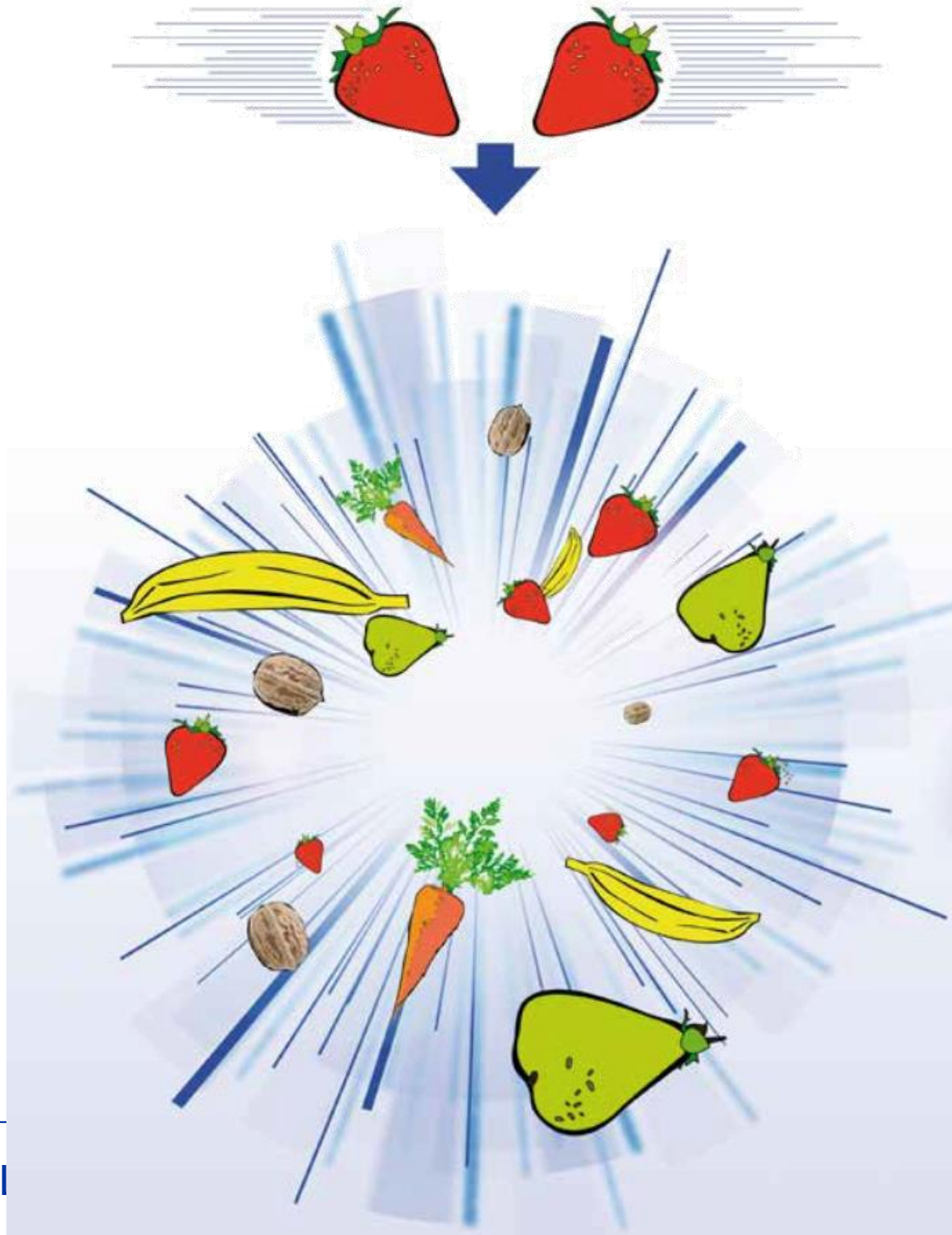
- 27-km long **particle accelerator**
- accelerates particles to nearly the speed of light in opposite directions and **brings these particles to collision** at four points
- accelerates protons or lead ions


LHC
CMS
CERN
ALICE
ATLAS
LHCb

What happens in a particle collision?



$E=mc^2$



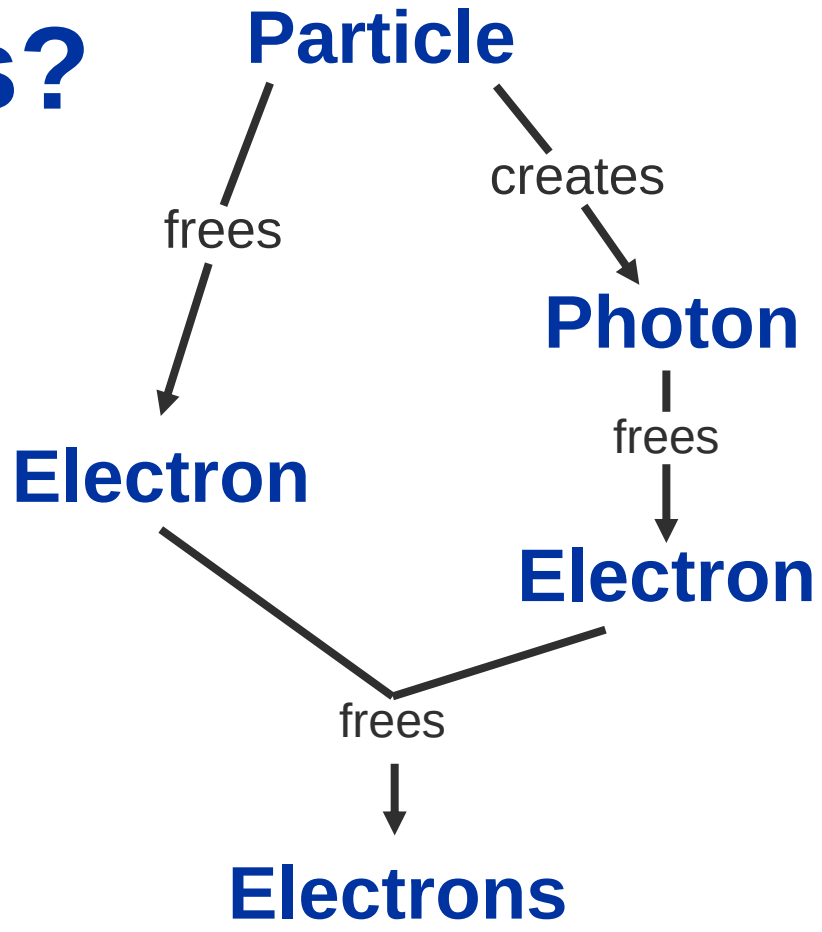
How can we detect particles?

Particle transfers some of its kinetic energy to the detector material

Ionisation: electrons are freed

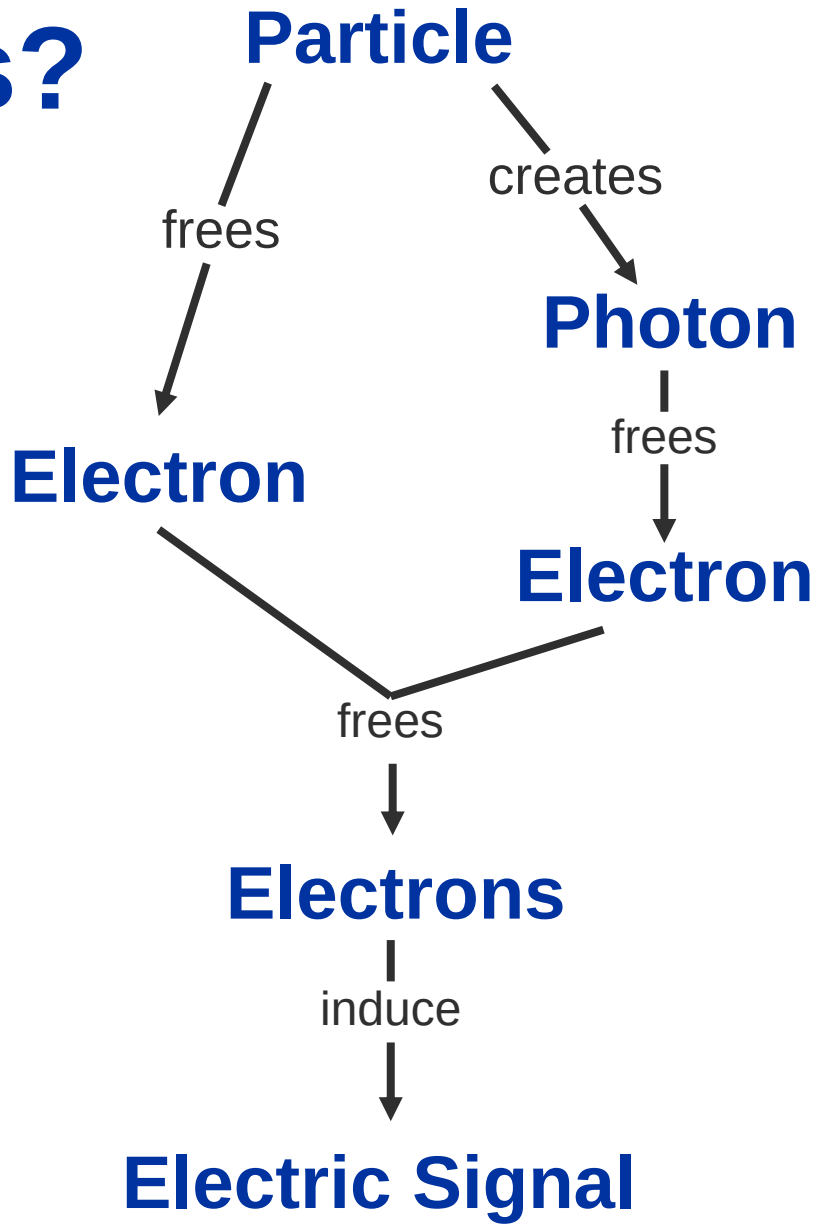
Scintillation: photons are created that subsequently free electrons (photoelectric effect)

⇨ **Avalanche effect:** one electron gains kinetic energy in an electric field and transfers kinetic energy to another electron, which is freed and so on …



How can we detect particles?

- **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**

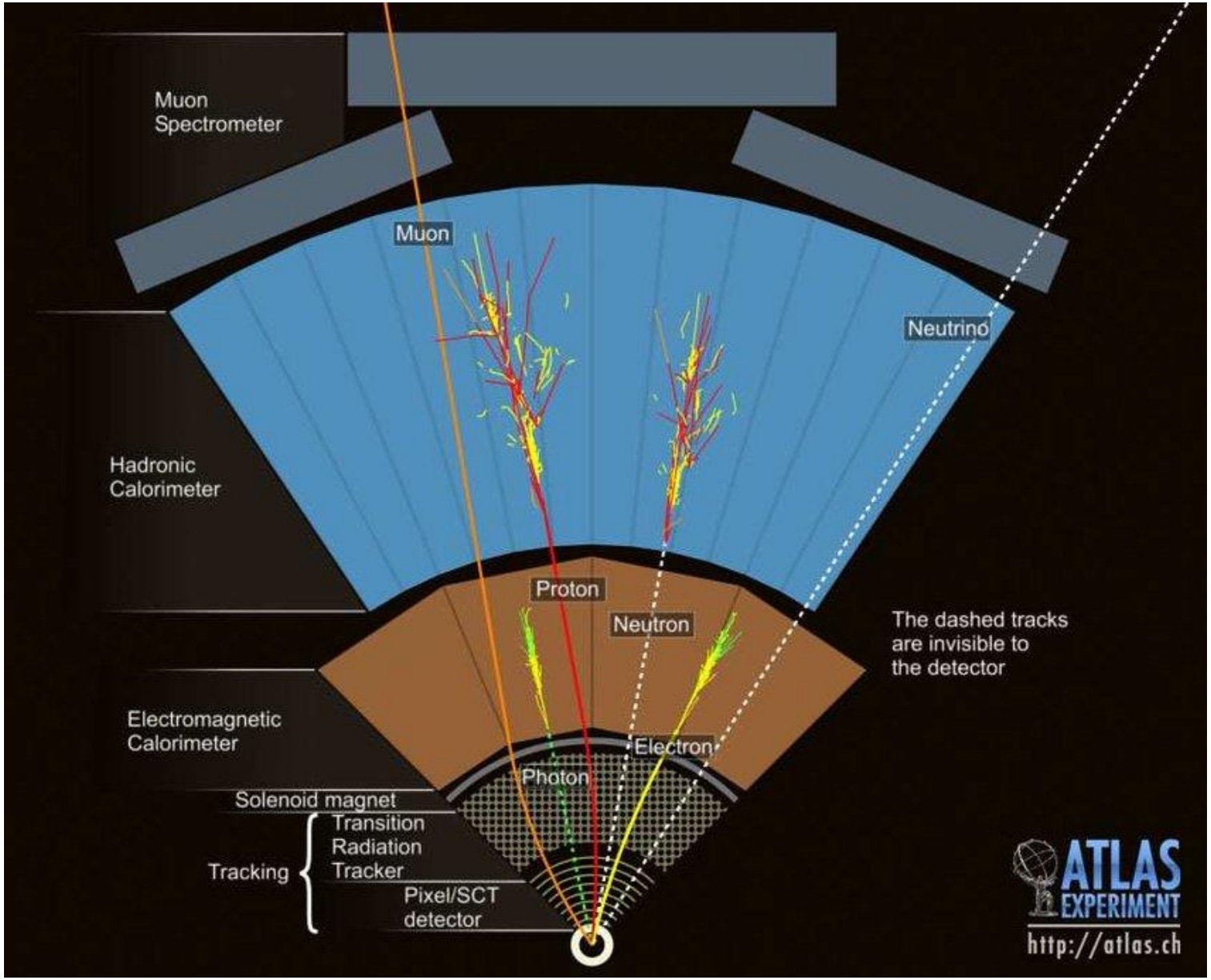
Particle tracks

Muon spectrometer

Hadronic calorimeter

Electromagnetic calorimeter

Tracking



Proposal submission

The submission opens on 31 January 2024.

Submission deadline: April 10, 2024

It’s time to write your proposals!

Questions?