

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

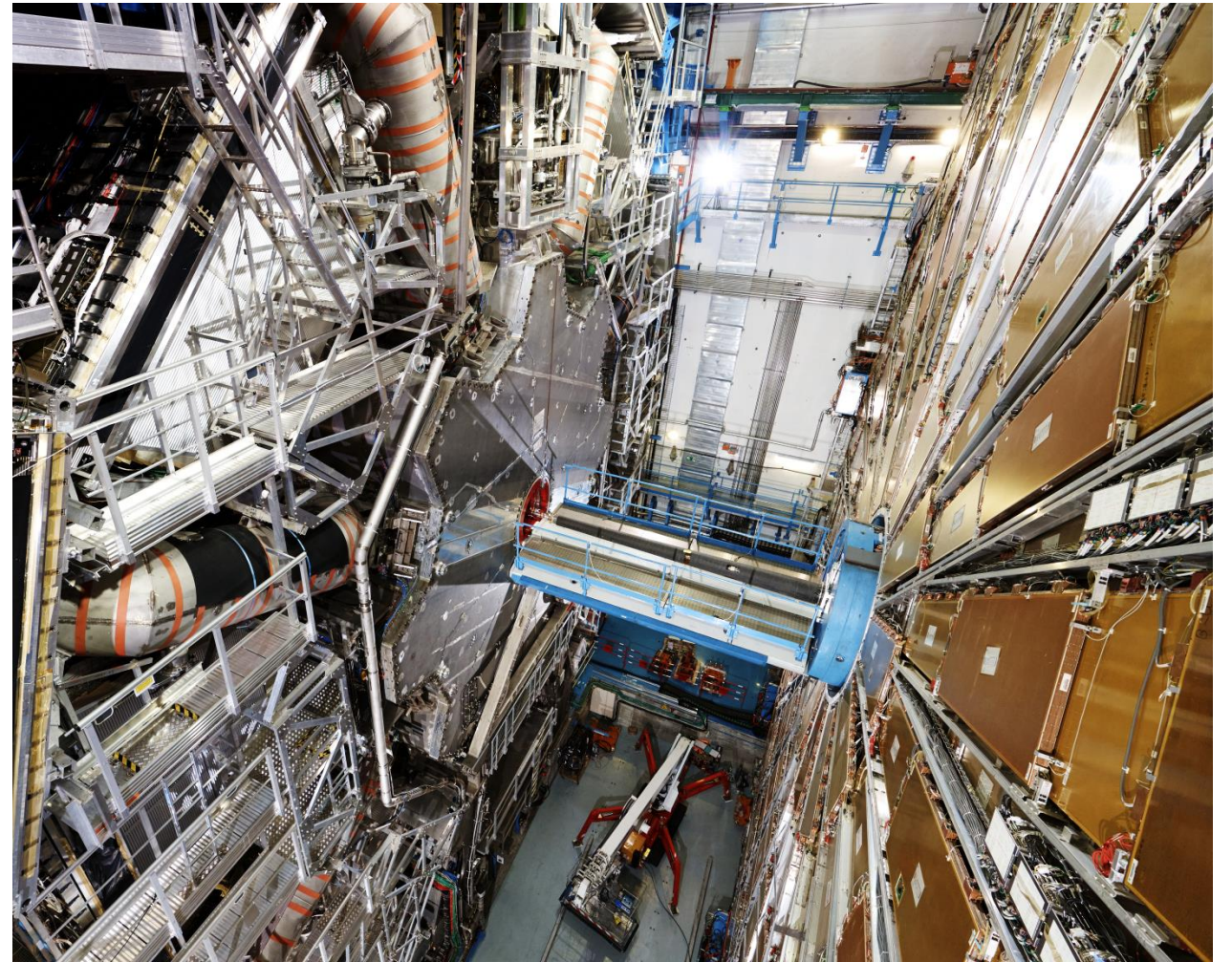
Q&A session

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



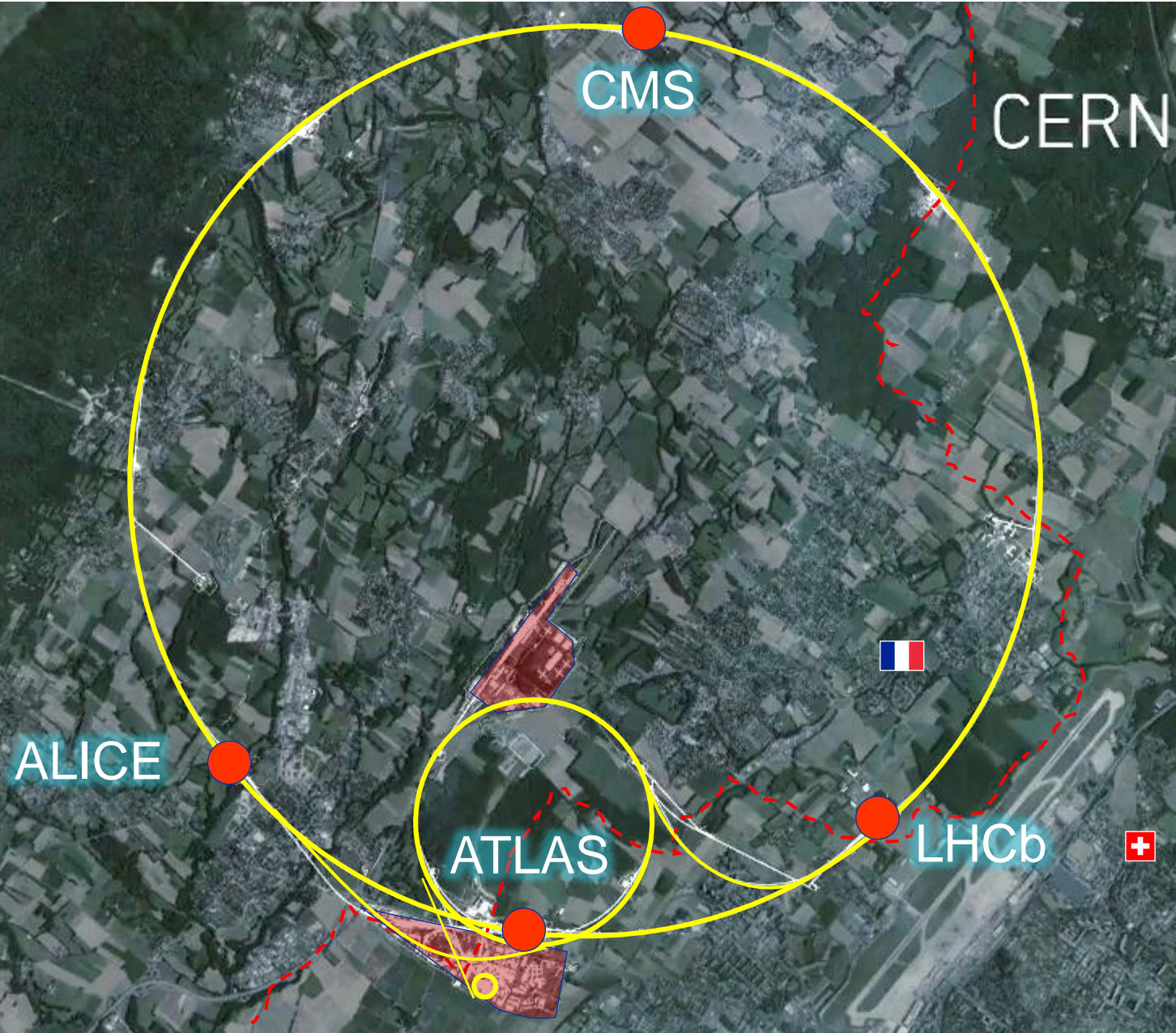
What is the LHC?

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

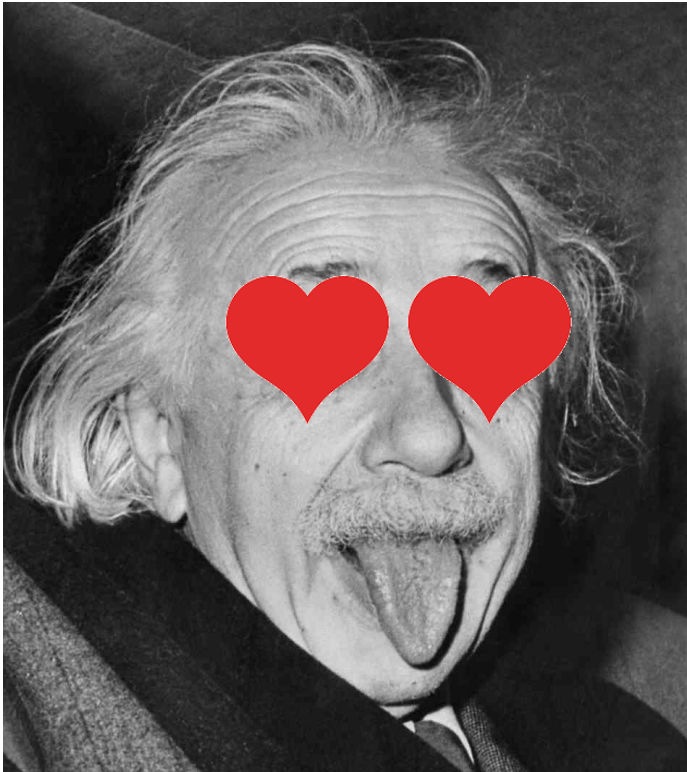


LHC

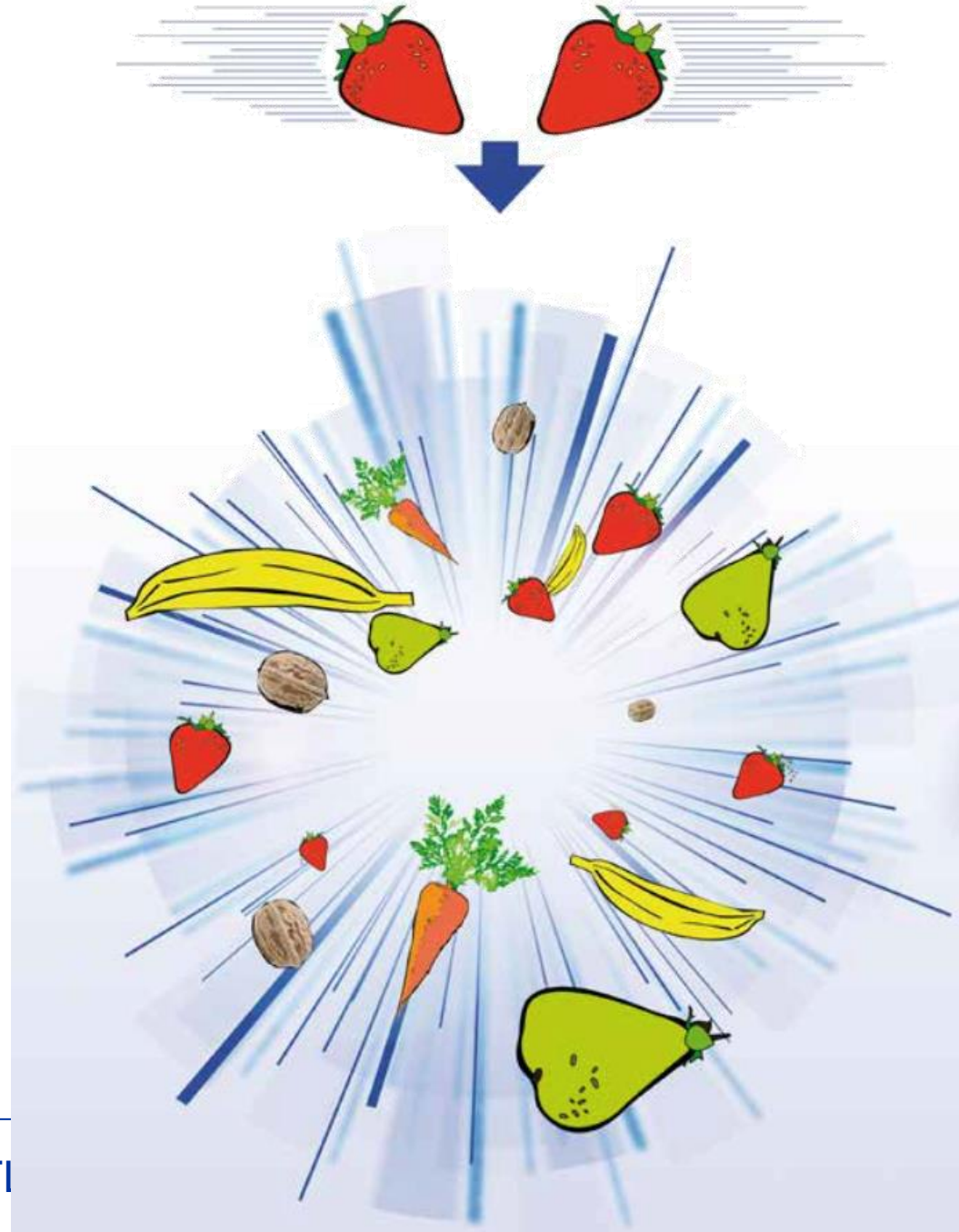
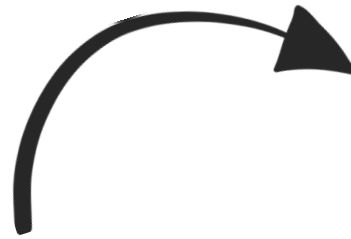


What happens in a particle collision?





$$E=mc^2$$



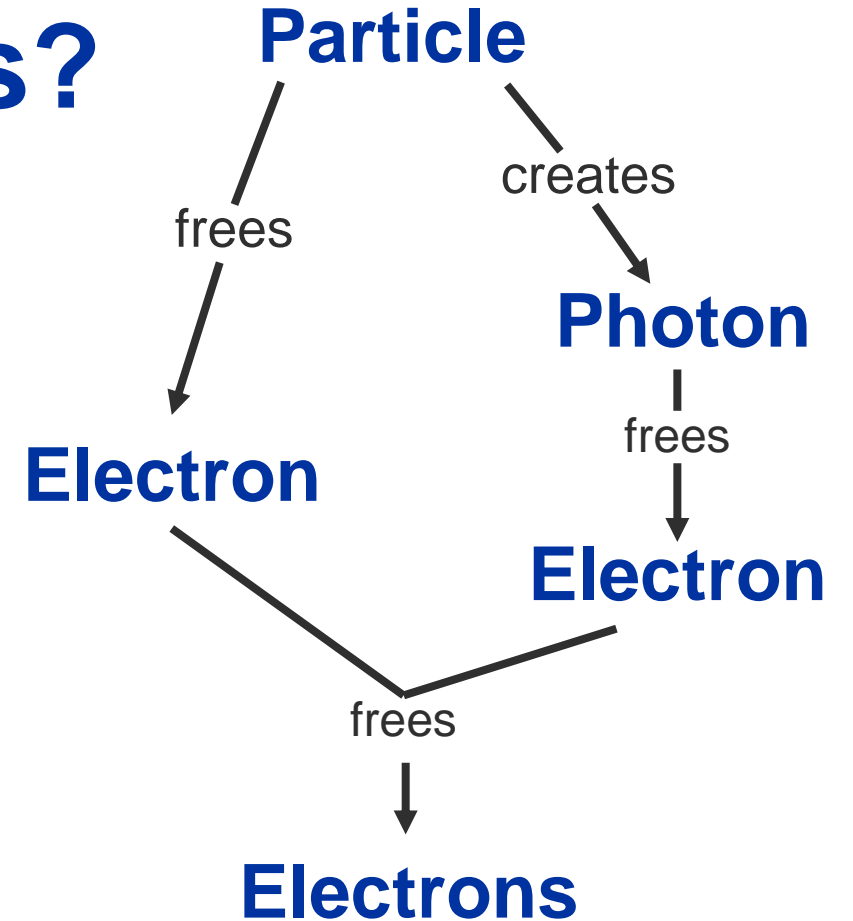
How can we detect particles?

Particle transfers some of its kinetic energy to the detector material

Ionisation: electrons are freed

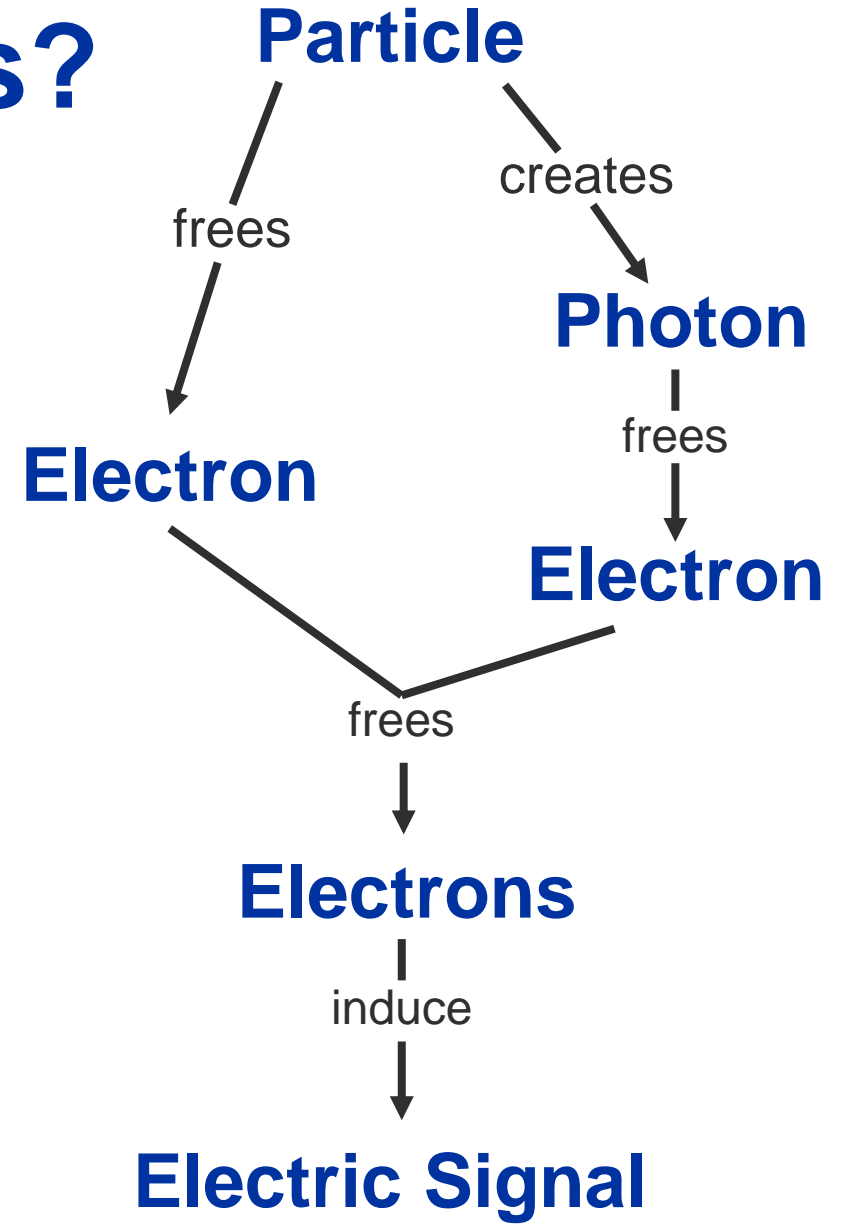
Scintillation: photons are created that subsequently free electrons (photoelectric effect)

⇒ **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**



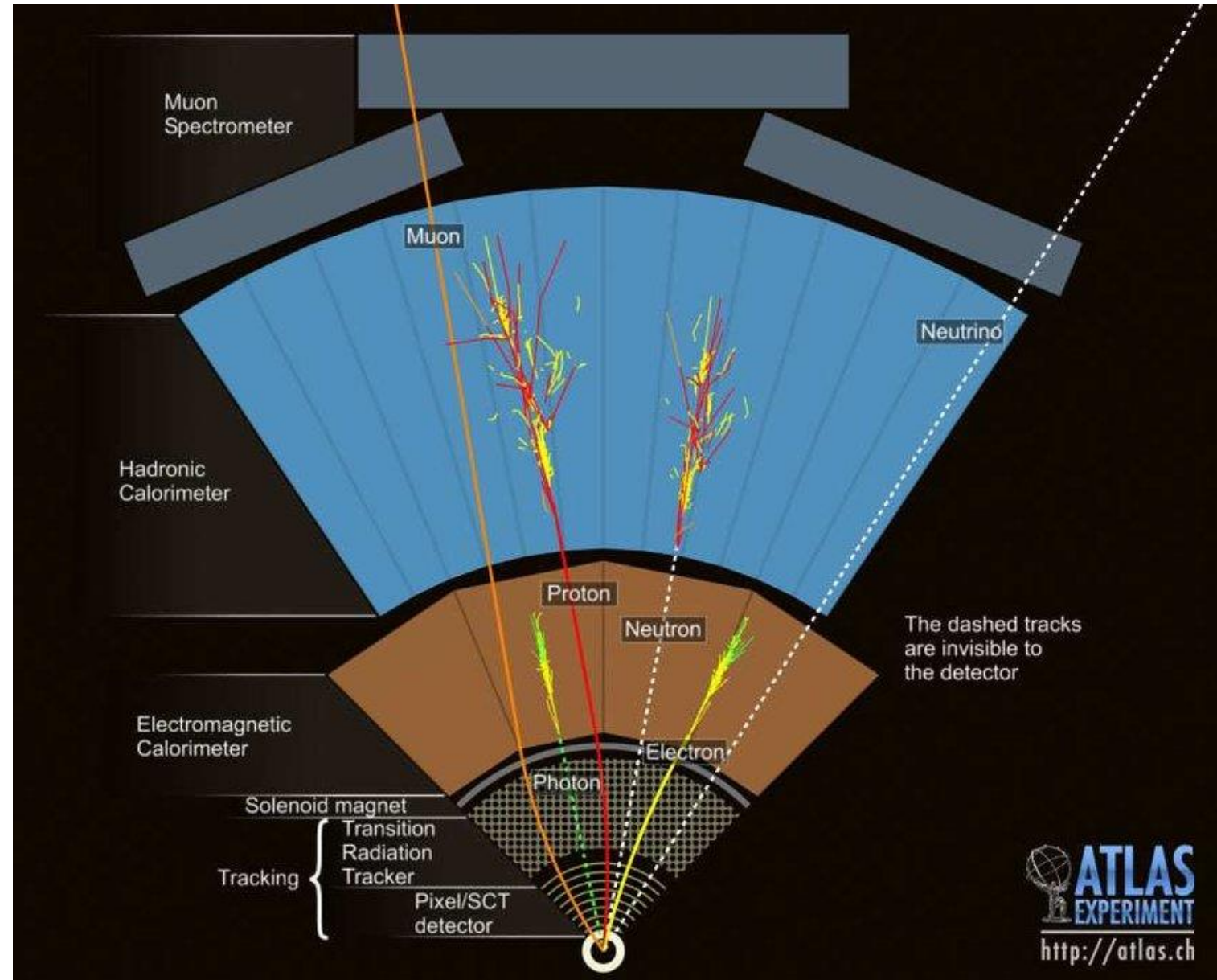
Particle tracks

Muon spectrometer

Hadronic calorimeter

Electromagnetic calorimeter

Tracking



Proposal submission

The submission opens on
31 January 2024.

Submission deadline:

April 10, 2024

The collage features several scientific documents and diagrams. At the top left is a document titled "Determining the relationship between the energy of a ... and react with a carbon-based, non-biological ... therapy" — an alternative Med ...". Below it is a document from Liceo Scientifico Statale "T.C. Onesti", Fermo, Italy, titled "Team TCO-ASA", which includes a grid diagram. To the right is a document titled "ChDR-CHEESE Cherenkov Diffraction Radiation - Characteristic Energy Emissions on Surfaces Experiment" by Silas Rahrberg Estévez et al., dated March 31, 2020, with a diagram showing ChDR and Cheese radiation patterns. In the center is a document titled "Detecting the Elusive Δ^+ Baryon in an Electron-Proton Inelastic Scattering Through its Decay-Products" by John Desalis et al., dated March 2002, which includes a histogram of $d^2\sigma/dE'd\Omega$ vs W and labels for elastic, inelastic, and deep inelastic scattering. At the bottom right is a document titled "Deep Inelastic Scattering" by Thomson, dated 2011, with a diagram of an electron and a proton.



It's time to write your proposals!

Questions?

