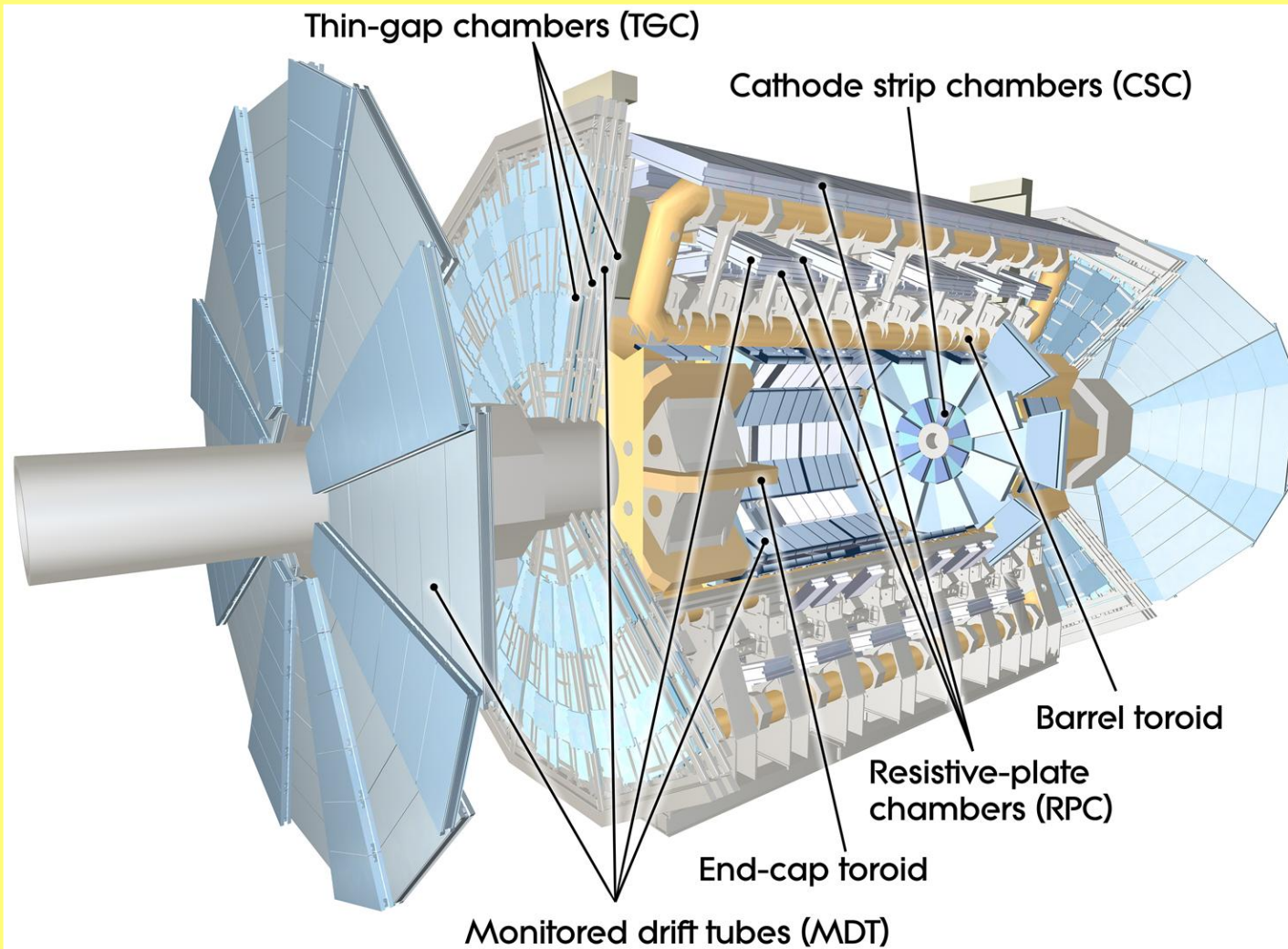


ATLAS

Mapping the secrets of the universe



ATLAS
EXPERIMENT

The Muon Spectrometer identifies and measures the momenta of muons

- Thin Gap Chambers (TGC) for triggering and 2nd coordinate measurement (non-bending direction) at ends of detector. 440 000 channels.
- Resistive Plate Chambers (RPC) for triggering and 2nd coordinate measurement in central region. 380 000 channels, electric field 5 kV/mm
- Monitored Drift Tubes (MDT) measure curves of tracks. 1171 chambers with total 354 240 tubes (3 cm diameter, 0.85-6.5 m long). Tube resolution 80 micron
- Cathode Strip Chamber (CSC) measure precision coordinates at ends of detector. 70 000 channels, resolution 60 microns.

Run 2 achievements

The MS is designed to detect muons up to $\eta = 2.7$ with an efficiency close to 99% (checked using Z and J/psi), and to provide momentum measurements with a relative resolution better than 3% over a wide pt range and up to 10% at 1 TeV.

RPC and TGC provide triggering capacity as well as position measurements with a typical resolution of 5 – 10 mm. MDT, and at high eta CSC, provide 6 to 8 measurements along the trajectory with a single hit resolution of 80 and 60 microns. The muon chambers are aligned with a precision between 30 and 60 microns. The material between the interaction point and the MS consists mostly of calorimeters and ranges from 100 to 190 radiation lengths.

Future challenges

Phase-I : at local hit rates about 500 Hz/cm² the MDT will start to lose spatial resolution and efficiency due to build-up of space charge in the gas volume. In places where this limit is reached, the MDT chambers will be replaced by new ones, with a smaller tube diameter. The new Small Wheels (nSW) are expected to eliminate 3 sources of fake triggers in the end-cap.

Phase-II : due to the expected increase of luminosity and radiation damage, the HL-LHC upgrade presents significant challenges to detectors, readout system and trigger. MDT readout cards must be replaced to cope with the rate, as well as the RPC barrel trigger system and the RPC readout. All of these will take advantage of the evolution of technology since the mid-nineties. For example the improvements in optical links will allow to move some cards away from the detector.



Web page
QR code