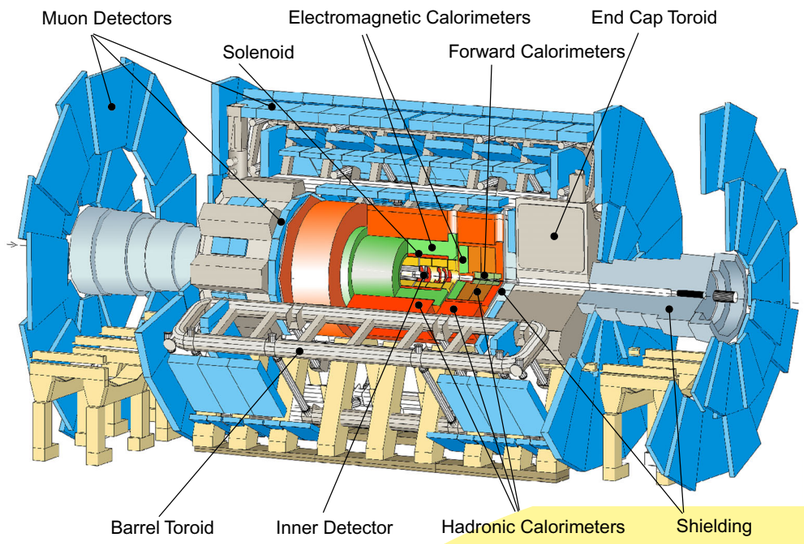
ATLAS Central Solenoid

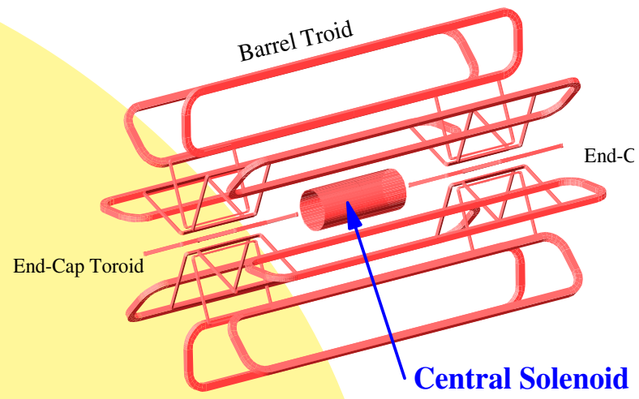
R.J.M.Y. Ruber, 29 May 2003



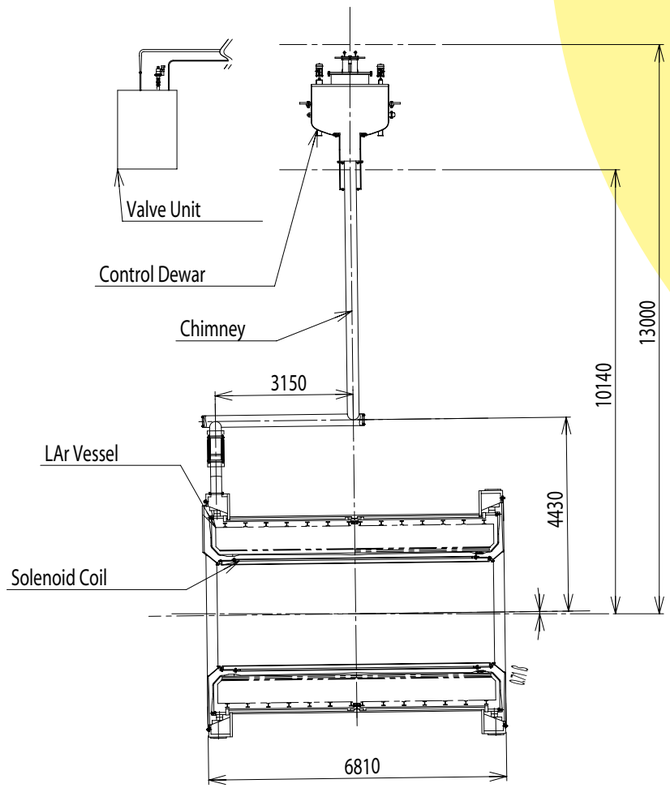
The goal of the ATLAS collaboration is to explore the fundamental nature of matter and the basic forces that shape the universe. There are 2000 physicist participating from more than 150 universities and laboratories in 34 countries.

The collaboration is preparing a general purpose detector set-up for experiments with proton-proton collisions as provided by the Large Hadron Collider (LHC).

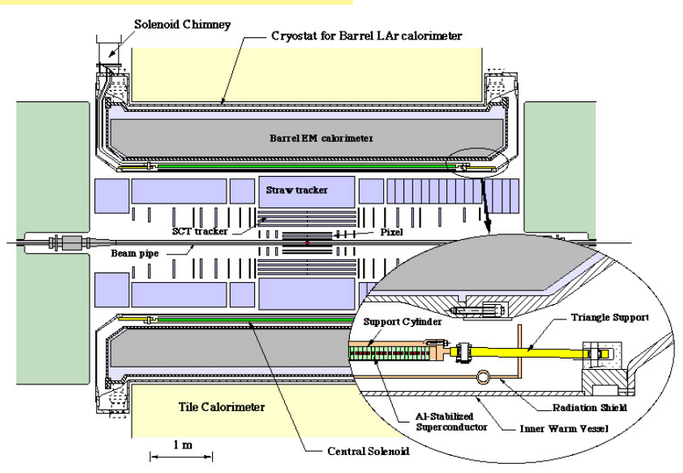
The magnet system provides the bending power required for the momentum measurement of charged particle tracks. ATLAS has a Central Solenoid with an axial magnetic field for the inner detector trackers, surrounded by a system of three large scale air-core toroids generating a tangential field for the muon spectrometer.



The superconducting cable has been fabricated in four units of 3000 meters length, which required three joints to complete the coil winding.



All connections are made through the control dewar situated on top of a 10 meter long chimney.



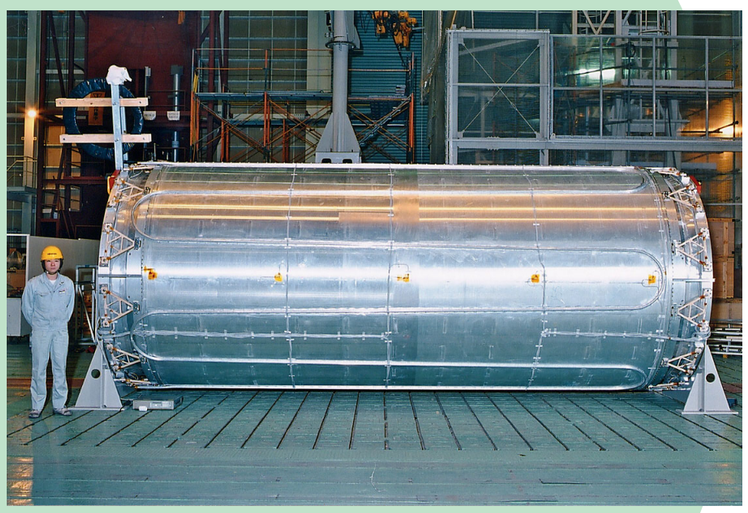
The Central Solenoid is magnetically decoupled from the toroid magnets. It is mounted in the same cryostat as the liquid argon calorimeter.

Twelve triangular glass-fiber supports sustain the coil inside the cryostat.

Transparency

Thickness = 45 mm, 0.64 X_0 (radiation length).

- common cryostat with LAr calorimeter
- high strength Al stabilized NbTi superconductor
- single layer edge-wise winding inside support cylinder
- indirect cooling by two-phase helium flow

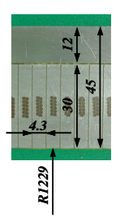


Main Parameters of the Central Solenoid:

Central magnetic field:	2.0 T
Operational current:	7600 A
Coil length at 4.5K:	5300 mm
Coil inner radius at 4.5K:	1229 mm
Coil thickness:	45 mm
Stored energy:	39 MJ
Cold mass:	5.6 ton

Main Parameters of the Conductor:

Cross section:	30 x 4.3 mm
Critical current at 5T and 4.2K:	22820 A
Overall yield strength at 4.2K:	146 MPa



Safety

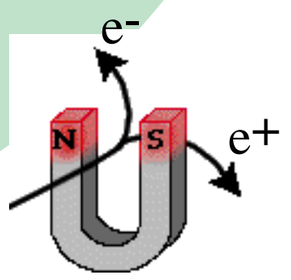
Against quench:
- pure Al strips improve propagation
- protection heaters

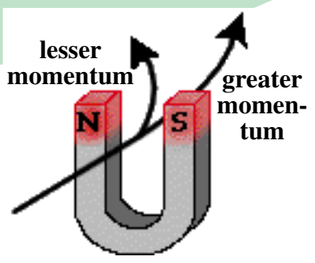
Cryogenic:
- cooling either forced flow or thermo-syphon

Mechanical:
- high strength Al stabilizer

Particles created in a collision can be studied e.g. by using a magnetic field.
For charged particles:

Opposite charges give opposite directions.





Different momenta give different bending radii.

KEK
High Energy Accelerator Research Organization

CERN
European Organization for Nuclear Research