

Mechanical Engineering of Accelerator Components and Peripherals

Antti Kolehmainen, Tommi Mikkola and Tuukka Lehtinen
on behalf of CERN EN-MME

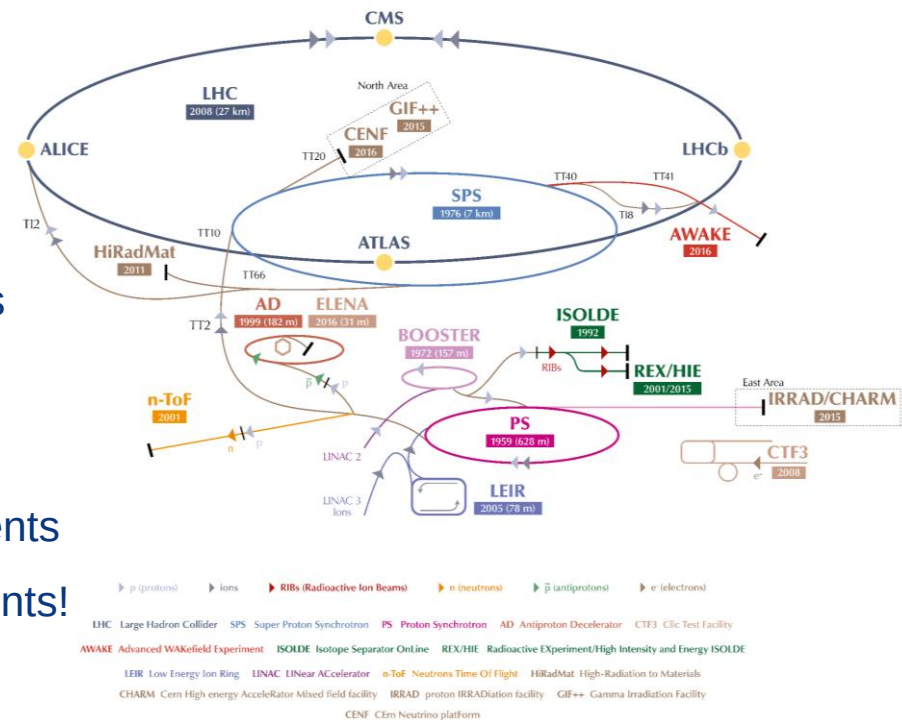


ENGINEERING
DEPARTMENT

CERN EN-MME Group

“The mandate of the MME group is to provide to the CERN community specific engineering solutions combining mechanical design, fabrication and material sciences.”

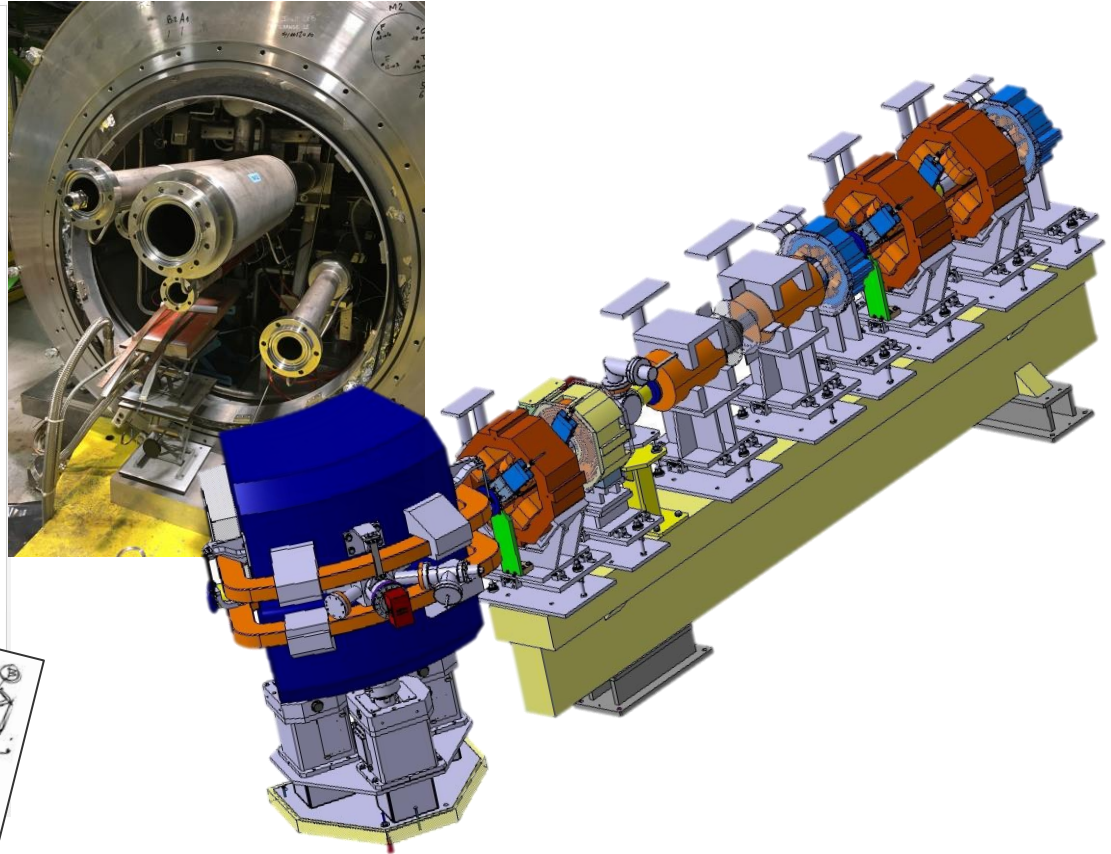
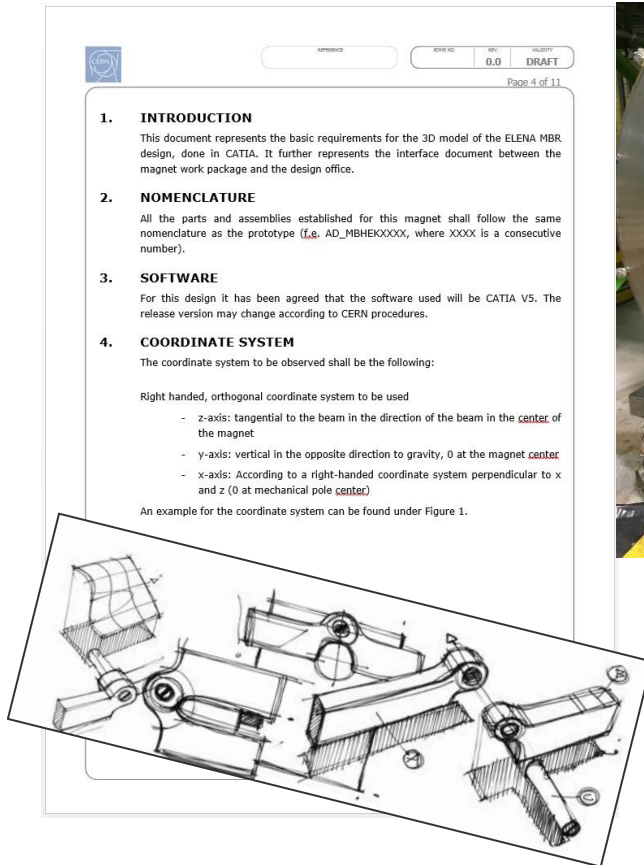
- EN-MME group size roughly 150 people
- Our main activities are:
 - Mechanical design
 - Engineering calculations and simulations
 - Production and sourcing
 - Material development
 - Mechanical and geometrical measurements
- We work on all the machines and experiments!



Mechanical Design – Design Inputs

Client specification

Space limitations and interfaces

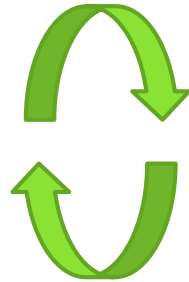


All project parties partake in defining design inputs!

Mechanical Design – Process

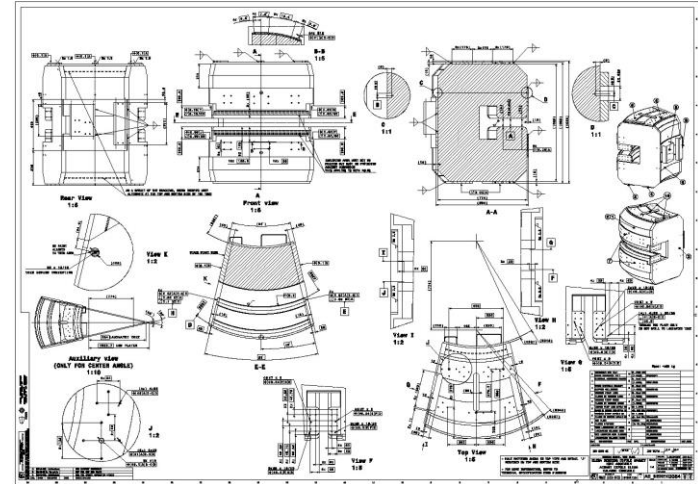
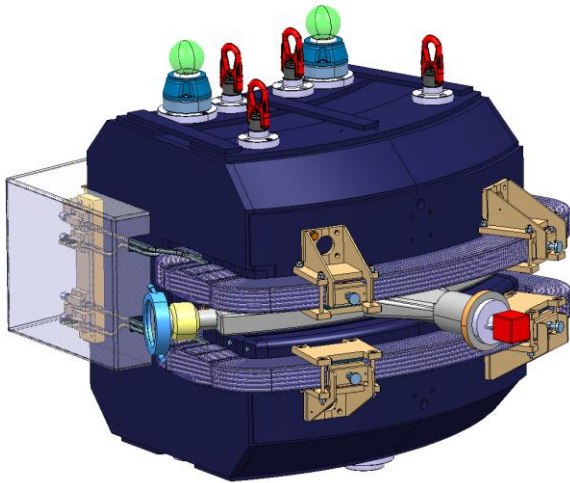
Iteration:

- Designer – Client
- Analysis, simulation
- Integration
- Manufacturing



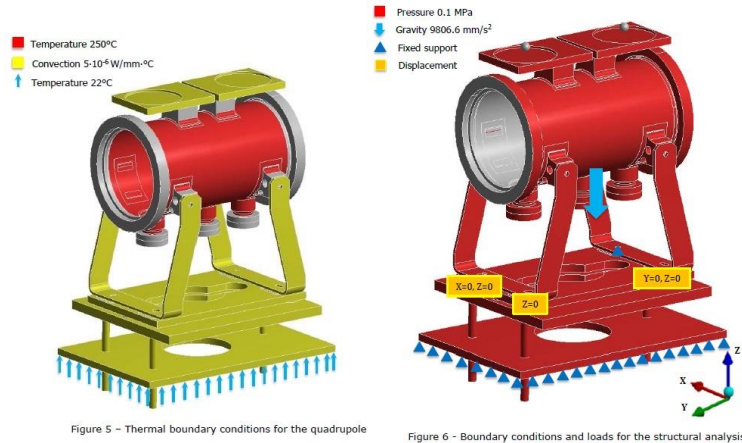
Deliverables:

- 2D drawings
- 3D models
- Supporting documents, such as analysis or measurement reports

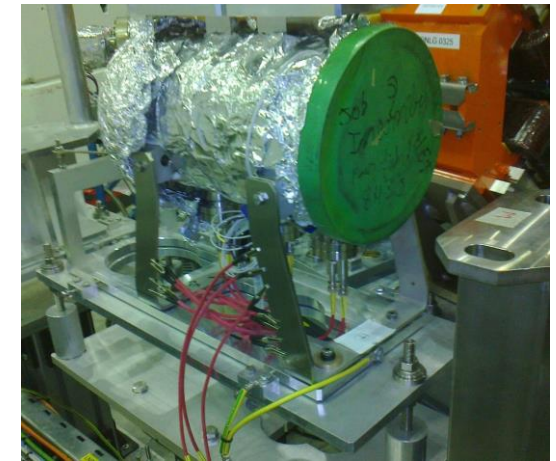


Engineering Calculations and Simulations

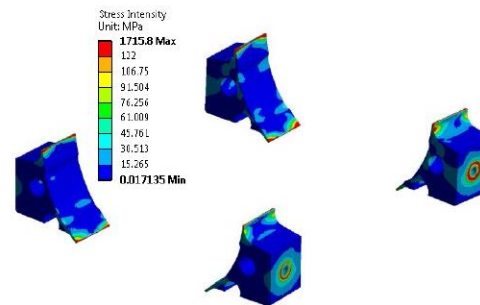
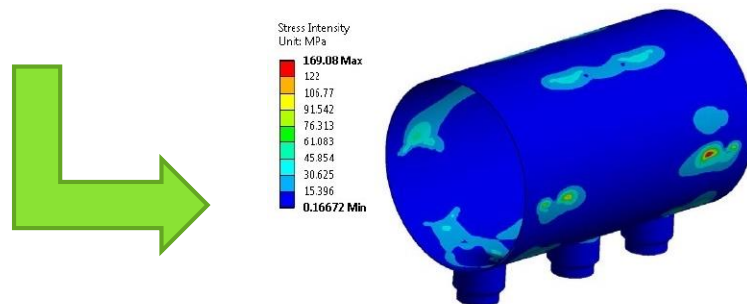
Why: To guide design work, to meet requirements, and to assess safety



Boundary conditions



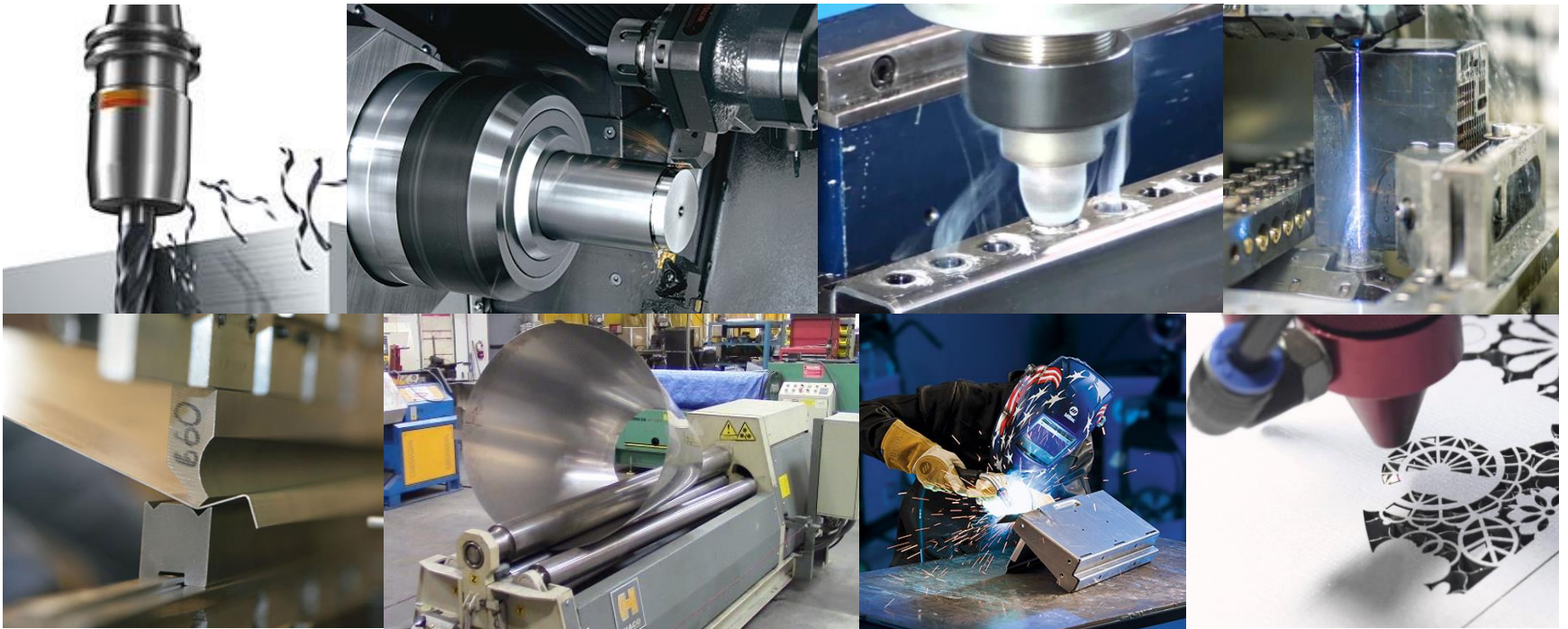
Functional device



Analysis results

Manufacturing and Production

- EN-MME operates three machine shops mostly for prototype and small series production
- Capabilities:
 - Machining: Milling, turning, drilling, cutting, grinding, electrical discharge machining, etc.
 - Forming: Sheet metal bending, rolling, punching, pressing, extrusion, etc.
 - Joining: Welding, brazing, soldering, etc.



Material Development and Measurements

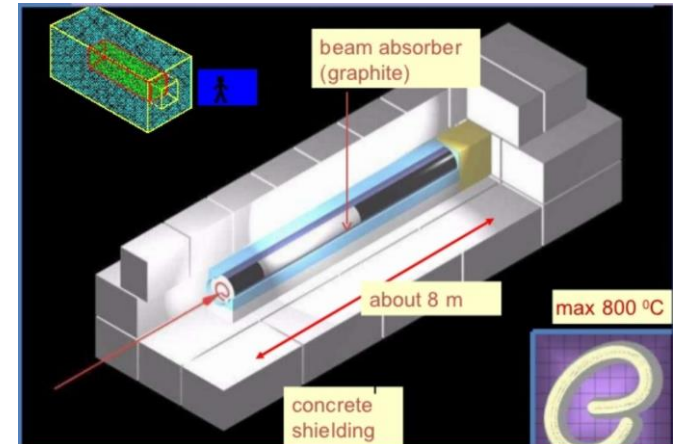
Material development examples:

- Graphites for beam impacts
- Stainless steel alloy for permeability

Mechanical measurement examples:

- Non-destructive testing: X-ray for LHC dipole magnets
- Destructive testing: Material tensile strength testing

Geometrical measurements: Verification of component compliance to specification (drawings and/or model)





ENGINEERING
DEPARTMENT

Questions!