

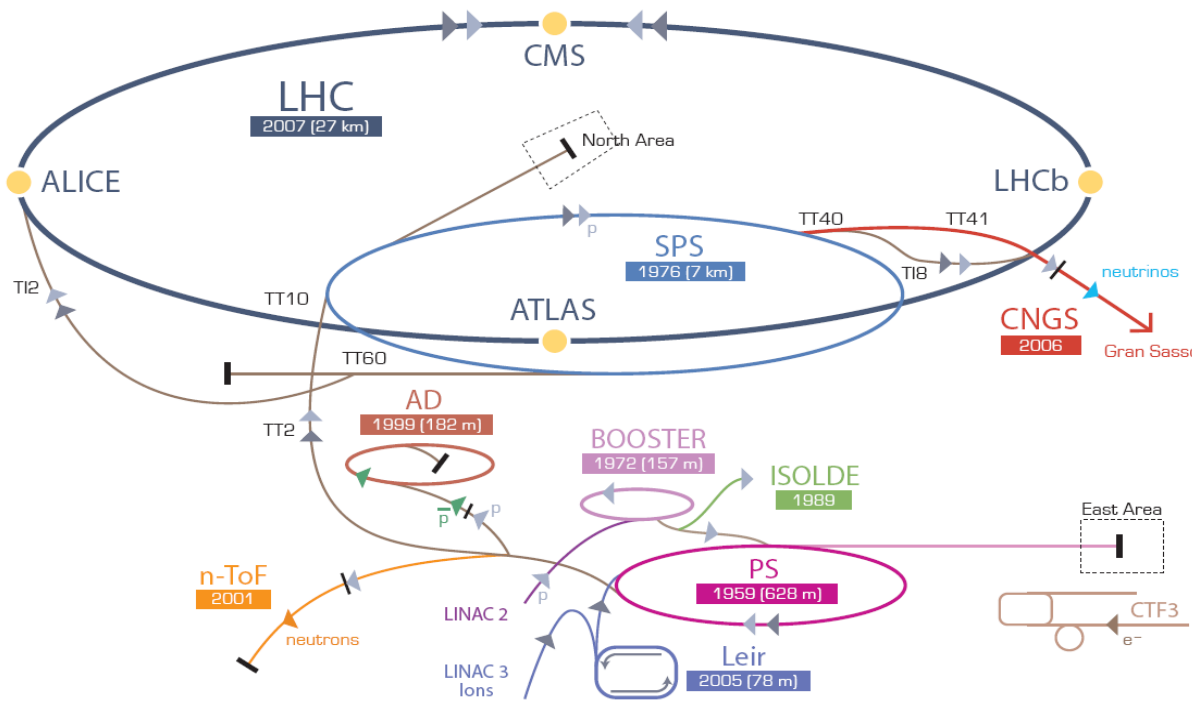


Training in Vacuum Technology for JUAS

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Vacuum @ CERN

CERN Accelerator Complex



▶ p [proton] ▶ ion ▶ neutrons ▶ \bar{p} [antiproton] ▶ \leftrightarrow proton/antiproton conversion ▶ neutrinos ▶ electron

LHC Large Hadron Collider SPS Super Proton Synchrotron PS Proton Synchrotron
 AD Antiproton Decelerator CTF3 Clic Test Facility CNGS Cern Neutrinos to Gran Sasso ISOLDE Isotope Separator OnLine DEvice
 LEIR Low Energy Ion Ring LINAC LINear ACcelerator n-ToF Neutrons Time Of Flight

Vacuum is necessary for the free circulation of beams.

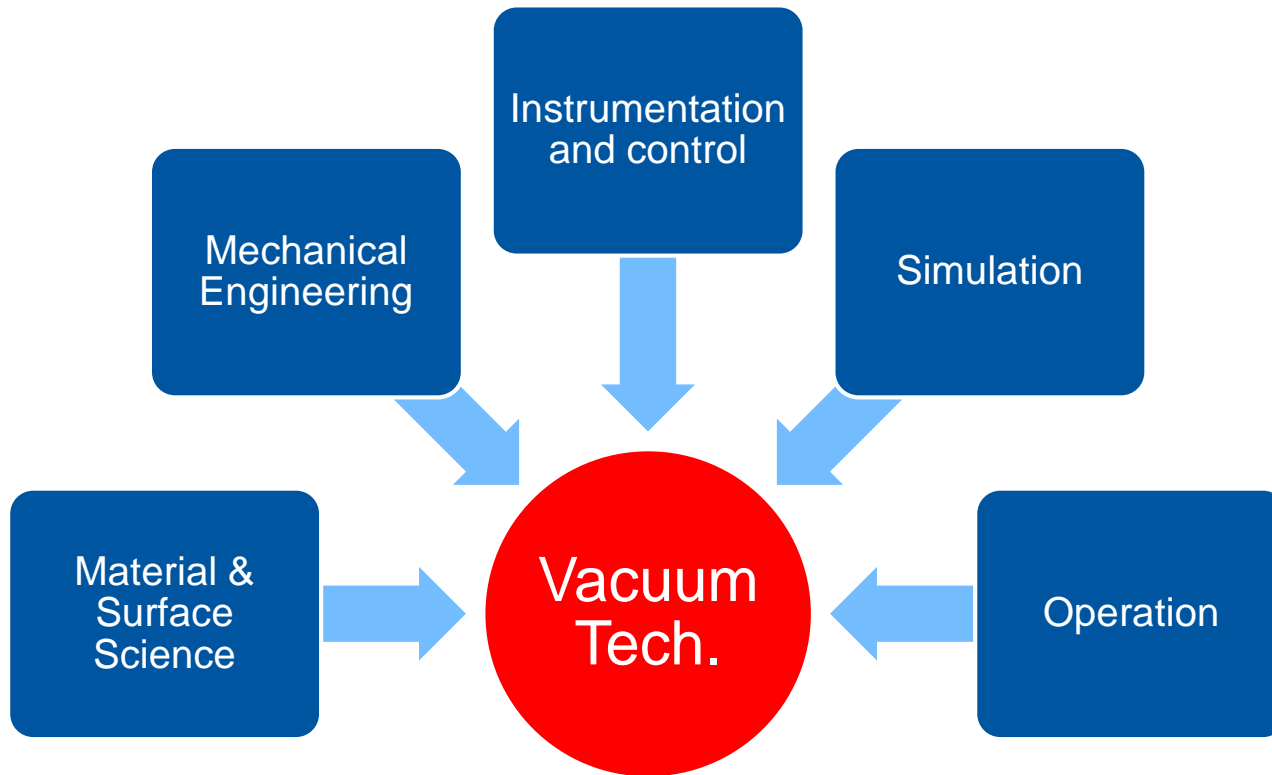
128 Km long vacuum system: the longest in the world.

Thousands of vacuum components (pumps, valves, gauges, ...).

All vacuum degrees and all vacuum technologies are employed at CERN.

Lowest pressure ever measured at room temperature: **10^{-14} mbar**







Vacuum, Surfaces



P. Chiggiano
Group Leader



P. Cruikshank
Deputy Group Leader

& Coatings group



D. Letant
Detached HDO
Group



P. Clerc
Group Secretary



G. Riddone
Group Coordinator

Vacuum Studies and Measurements



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Section Leader



S. Calatroni



B. Henrist



B. Jenninger



R. Kersevan



P. Lancon



S. Meunier



I. Wevers

Beam Vacuum Operation



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Section Leader



D. Calegari



G. Catenoz



J. Chauré



C. Colomb P.



P. Demarest



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J. Finelle



A. Harrison



J. Kortzmas



P. Lepeule



G. Merino F.



A. Michet



E. Page



C. Pasquino



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N. Thaus



C. Yin Vallgren



N. Zelko

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A. Bruton



C. Duclos



J. Hansen



H. Kos



N. Kos



W. Moon



M. Mslabaila



L. Mounier



J. Perez Espinos



H. Rambeau



M. Sitko



A. Vidali

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J.R. Alvelos Ferreira



S. Blanchard



J.-P. Bolvin



N. Chatzigeorgiou



F. Deligault



J. De La Game S.



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H. Vestergaard

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M. Taborelli
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J. Cavé



C. Charvet



P. Costa Pinto



L. Ferreira



F. Fesquet



S. Forel



P. Garrity



L. Leggiero



P. Maurin



A. Mongelluzzo



H. Neupert



G. Rosez



A. Sapountzis



A. Sublet



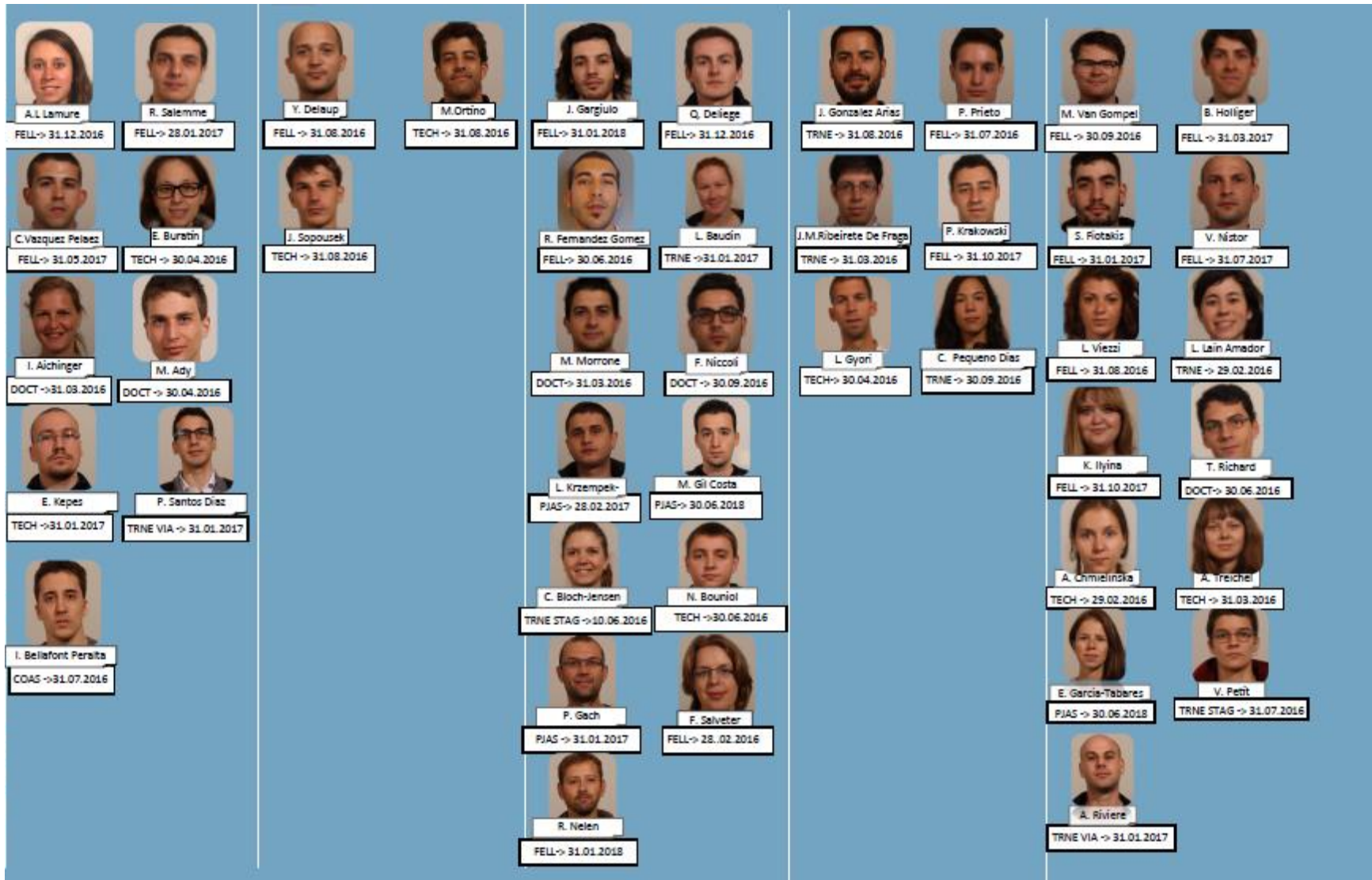
B. Teissandier



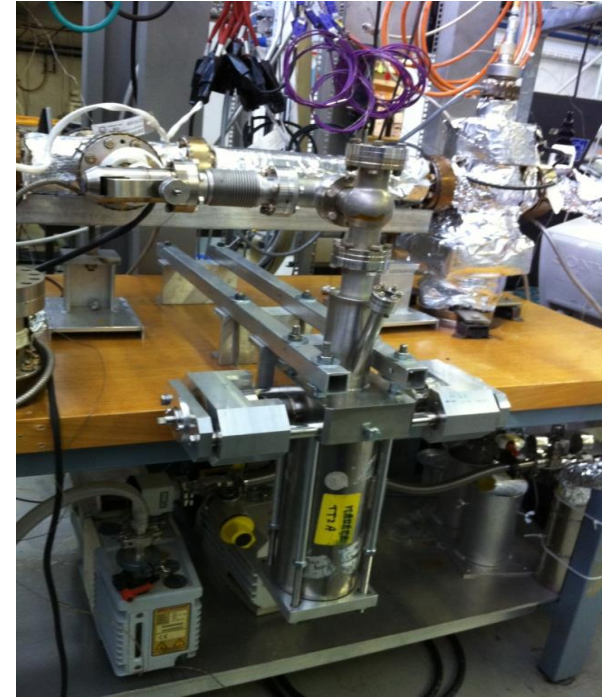
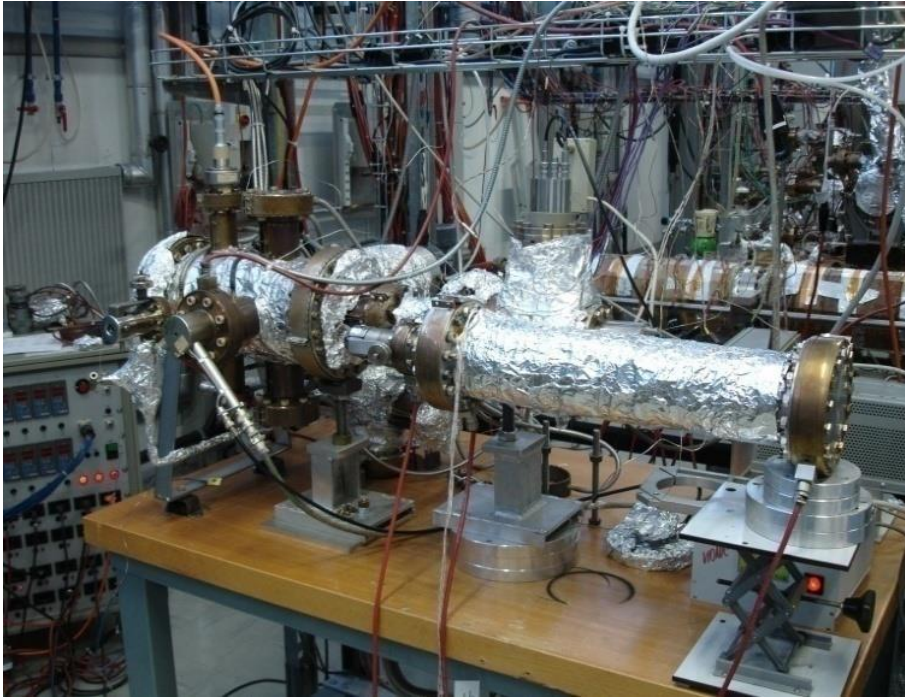
M. Thibert



W. Vollenberg

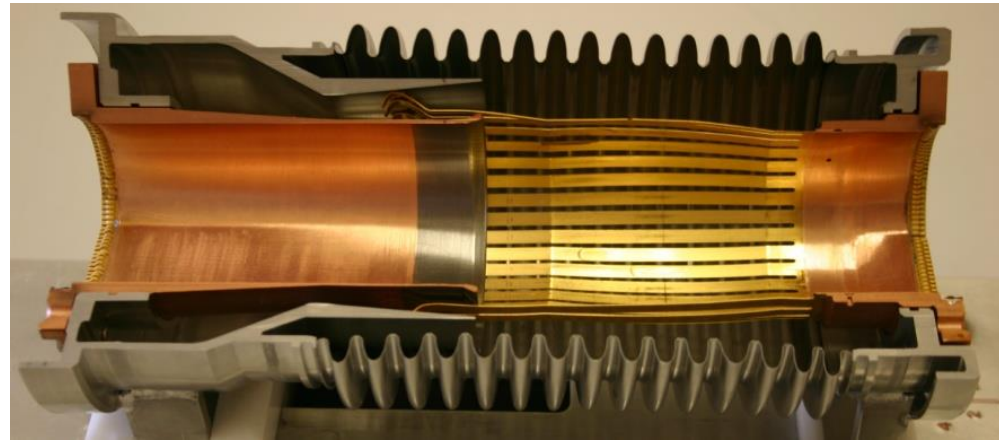


Activity 1: Outgassing rate measurement

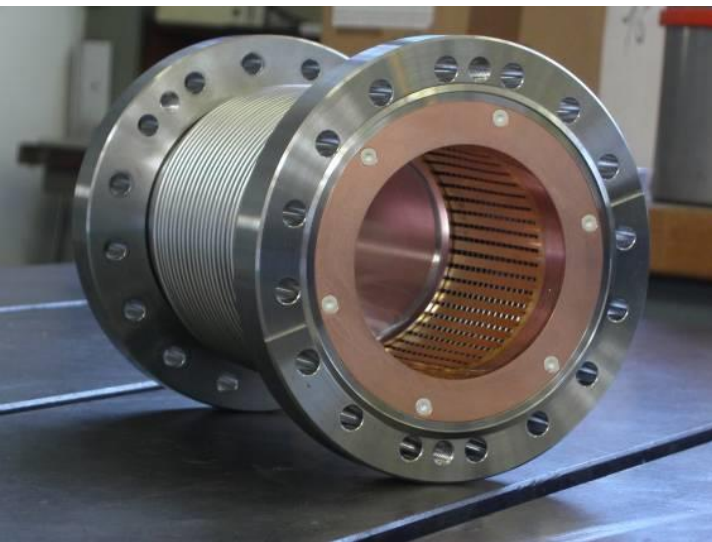


- Assessment of vacuum components in terms of:
 - Surface cleanliness
 - Outgassing rate (H_2O and H_2)

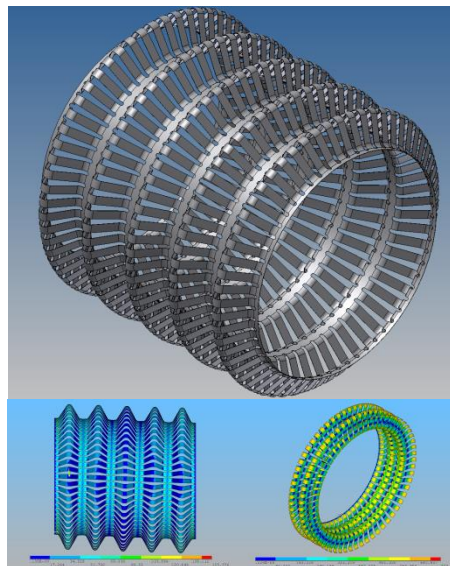
Activity 2: Mechanical design for vacuum technology



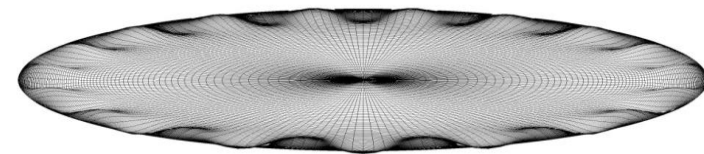
Design



Production



Computation



Thin walls

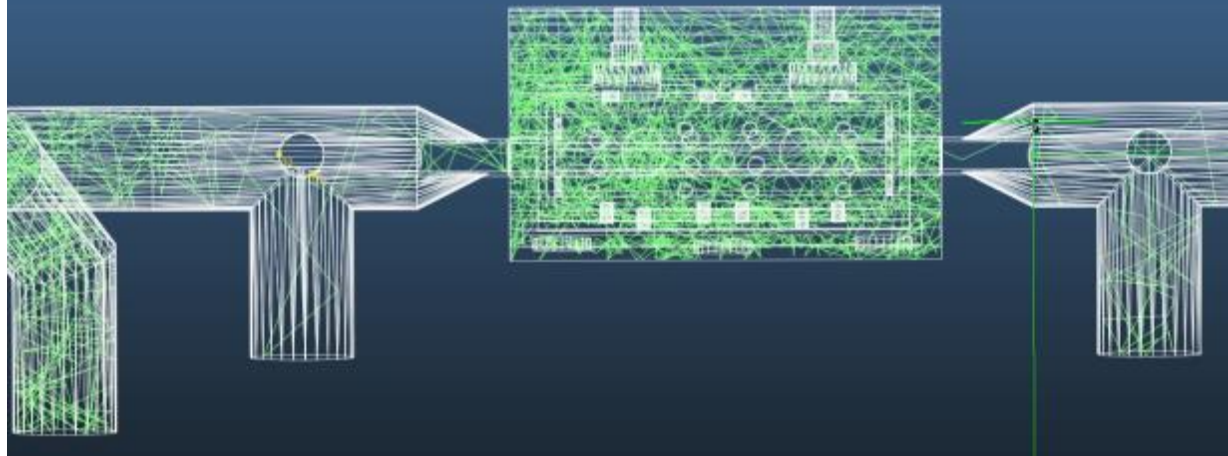
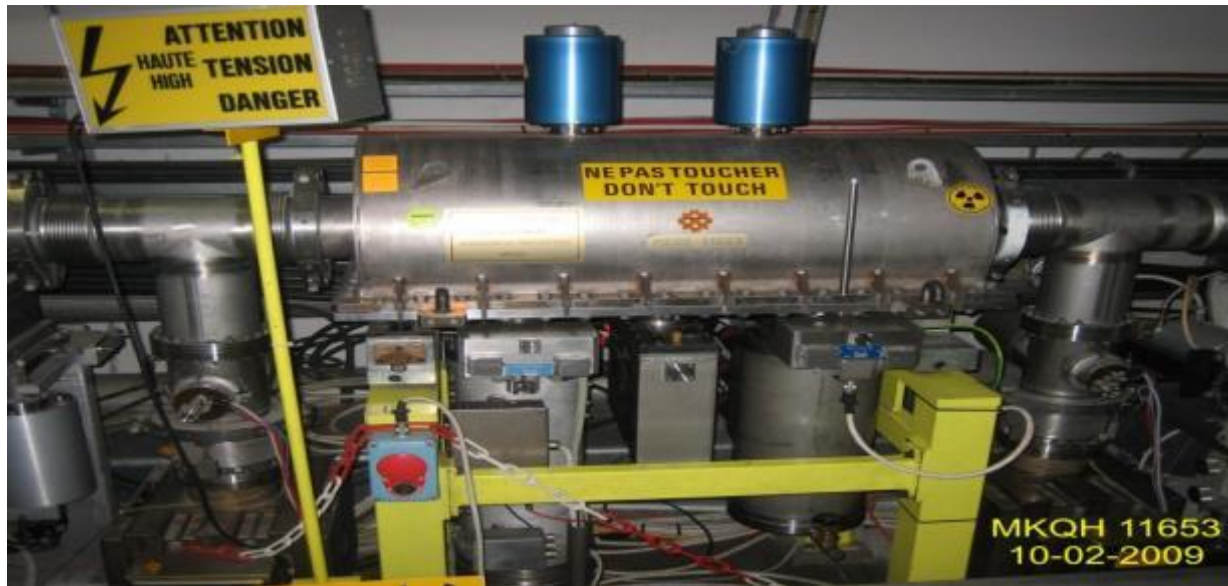


Activity 3: Instrumentation

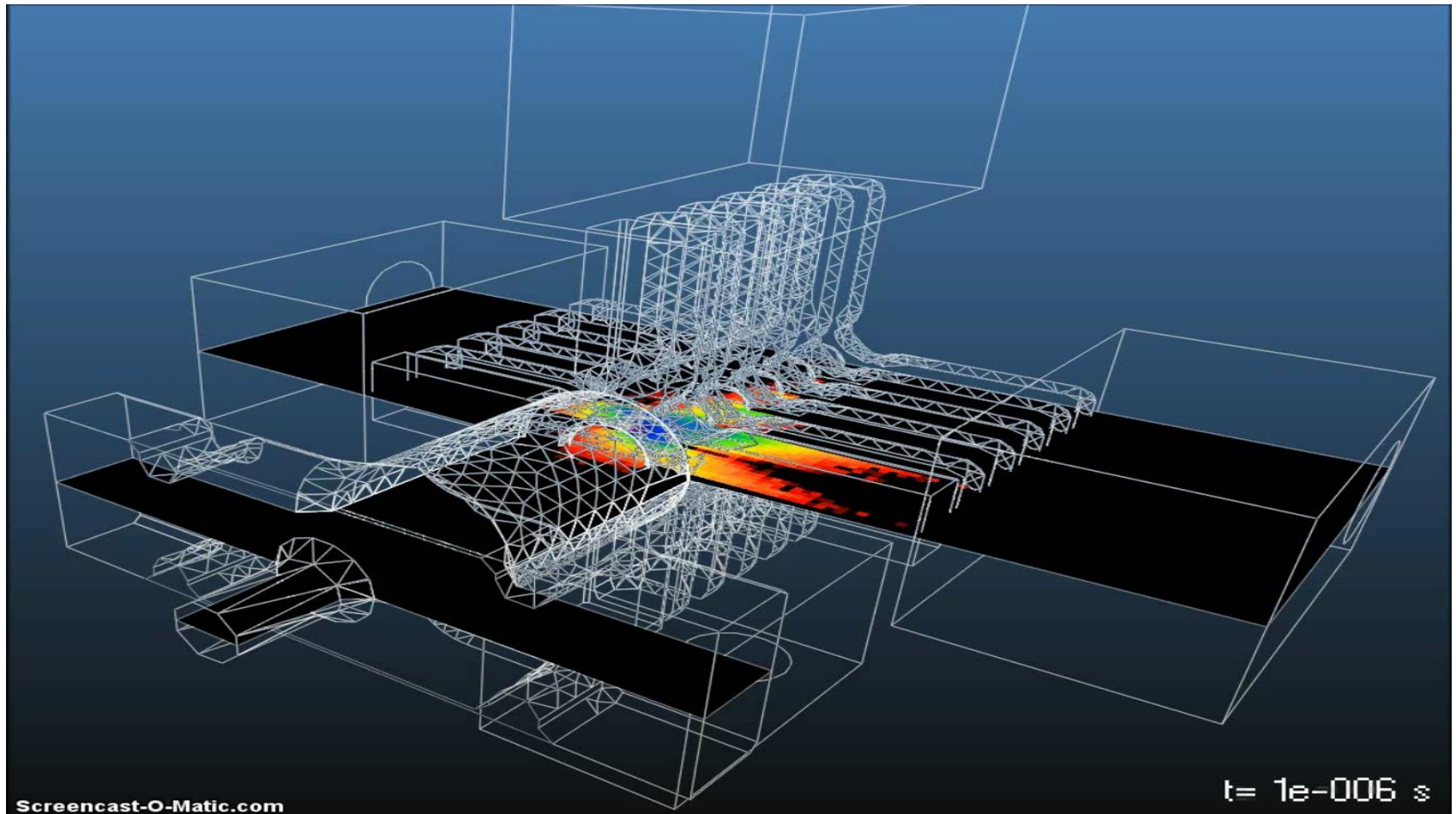


- Quantitative pressure measurement
- Quadrupole gas analyzers and quantitative partial pressure measurement
- Calibration of instruments

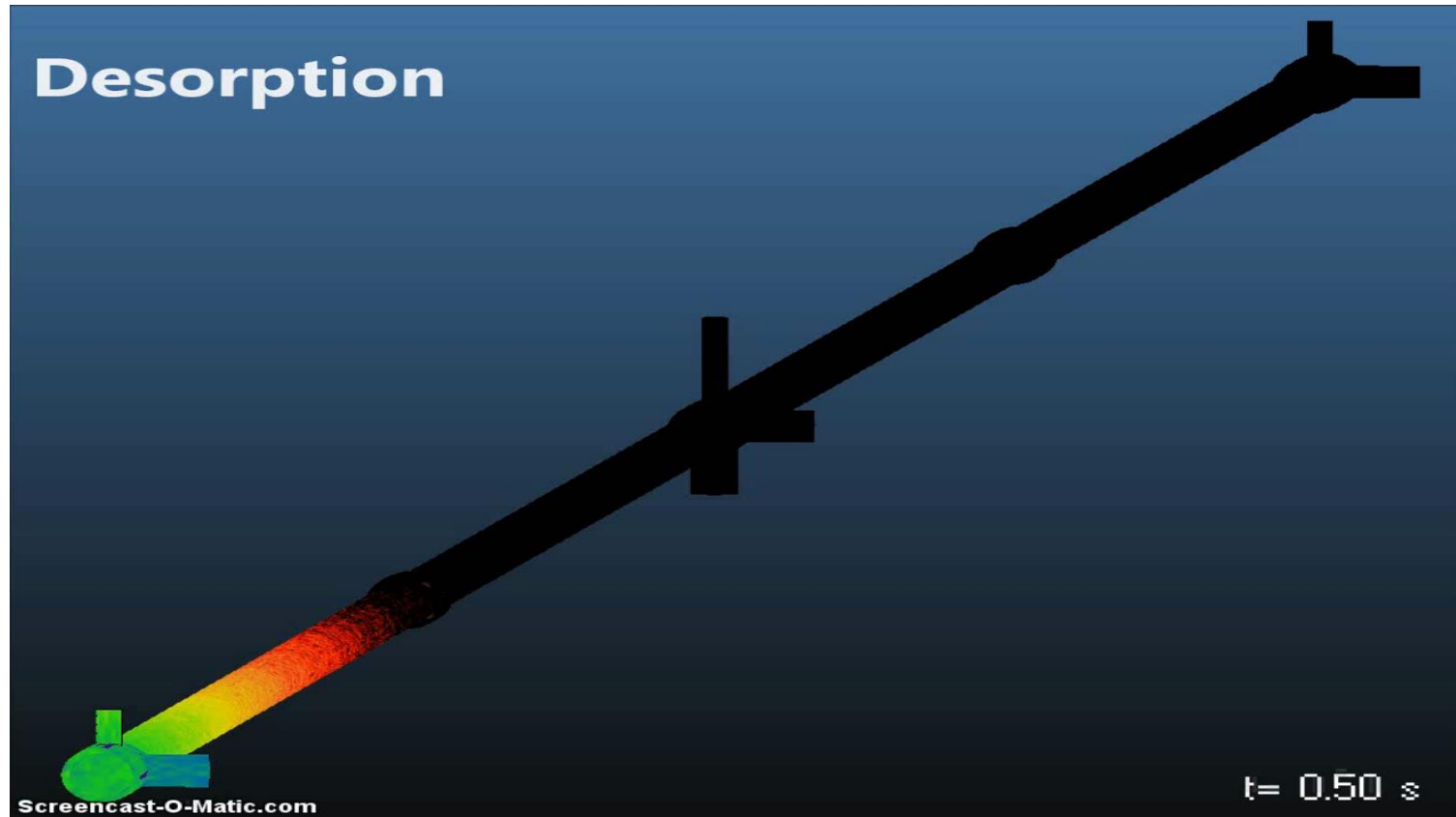
Activity 4: pressure profile calculation



Time-dependent M-C simulation

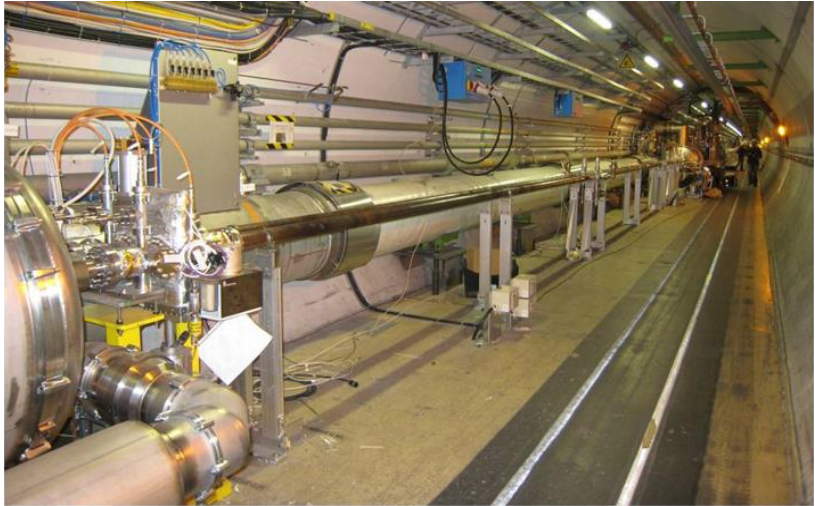
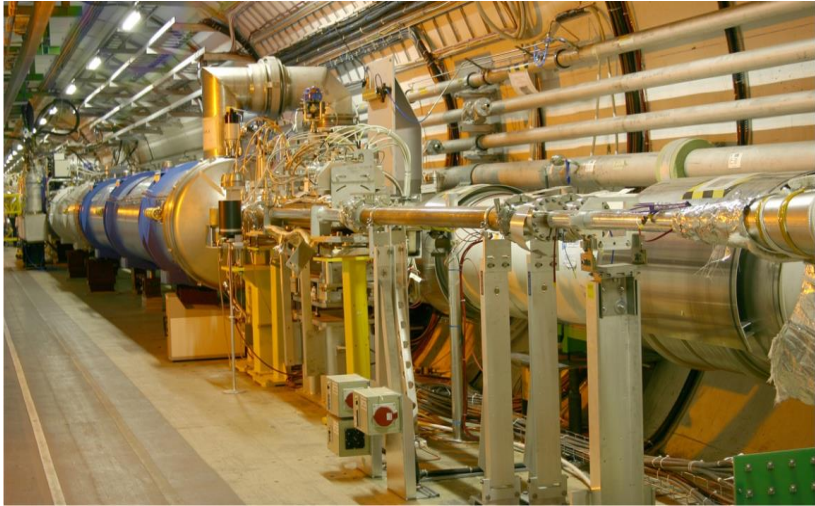


Time-dependent M-C simulation

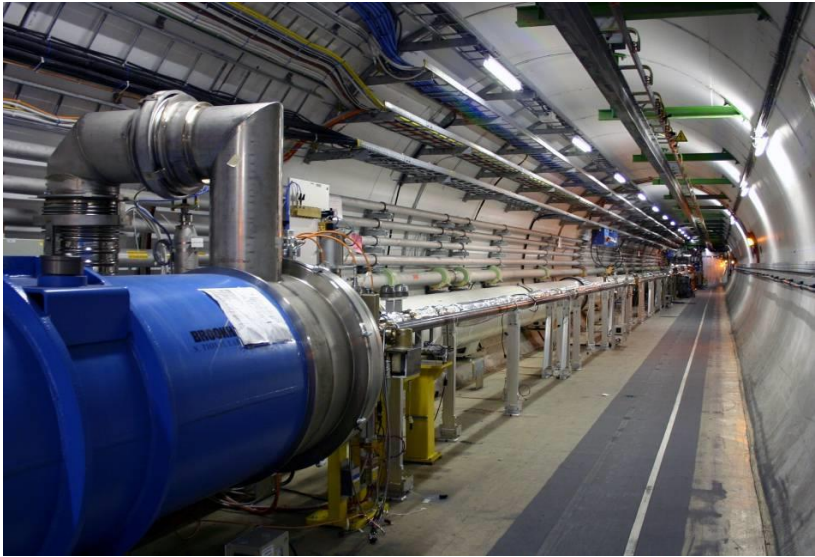
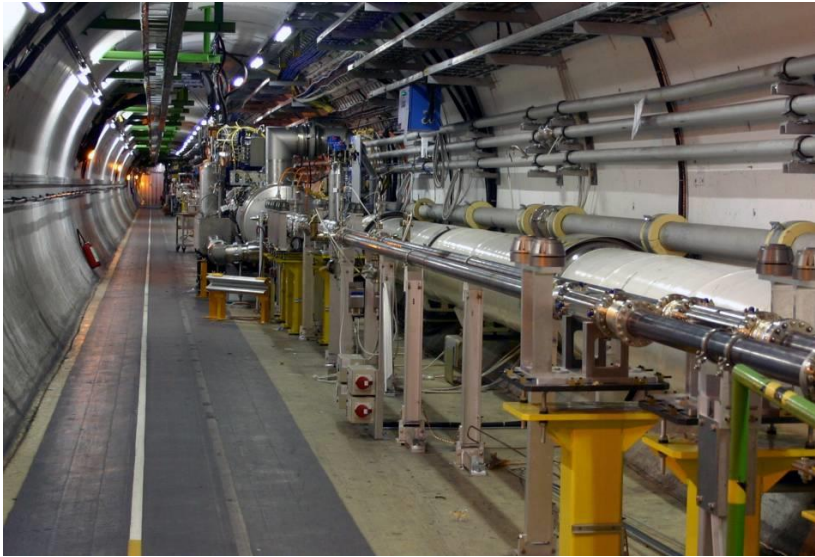


Do not forget operation...

Examples of vacuum systems in the LHC



LHC

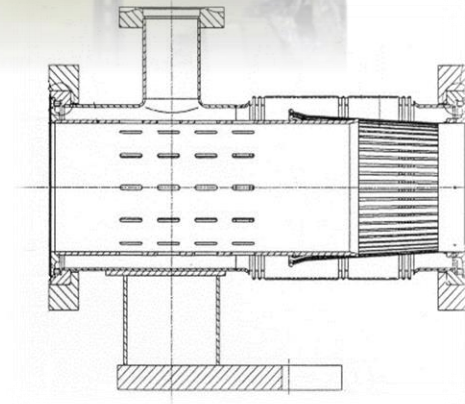
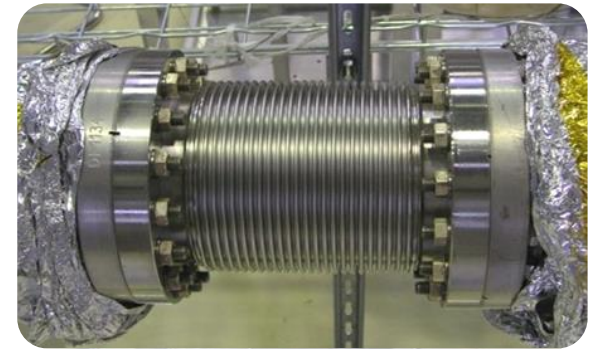


Examples of vacuum systems in the LHC



Vacuum technicians installing part of the beam pipe support system

Activity 5: LHC vacuum system with NEG

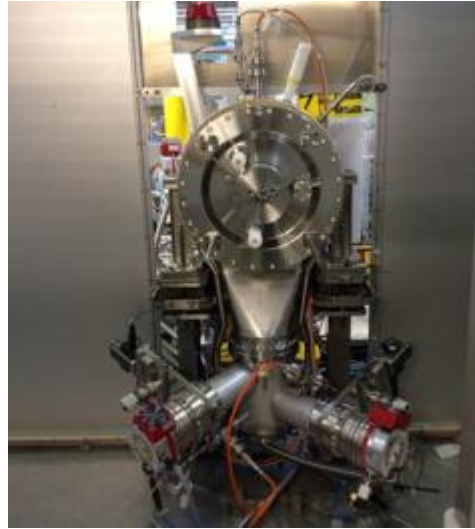


- Thin film coating for the LHC
- LHC vacuum components
- The LHC collimators and their vacuum system
- Bakeout and NEG activation

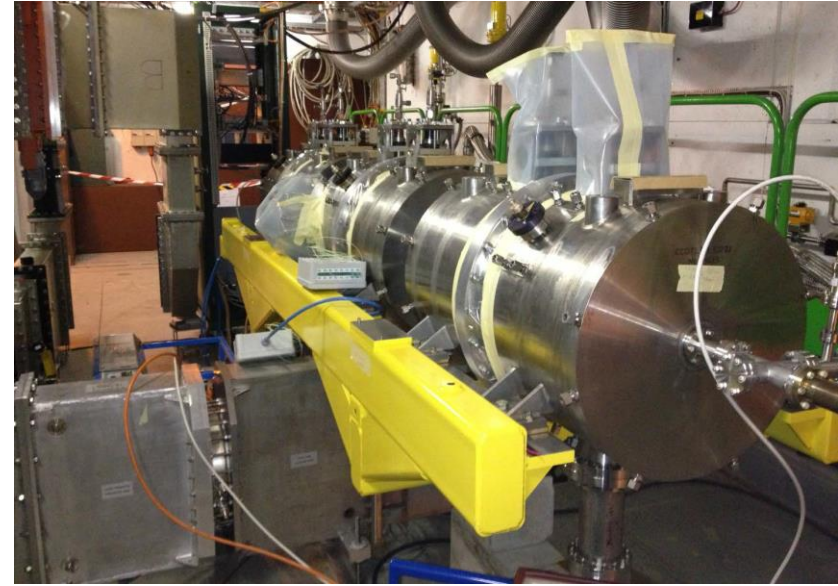
Activity 6: leak detection



Leak and pressure test of PIMS disks



Leak test of new source



Acceptance test of CCDTL module



Leak test of DTL Drift tubes.

Helium leak tests for the Linac 4.

We are looking forward to introducing our work to you at **CERN !**





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