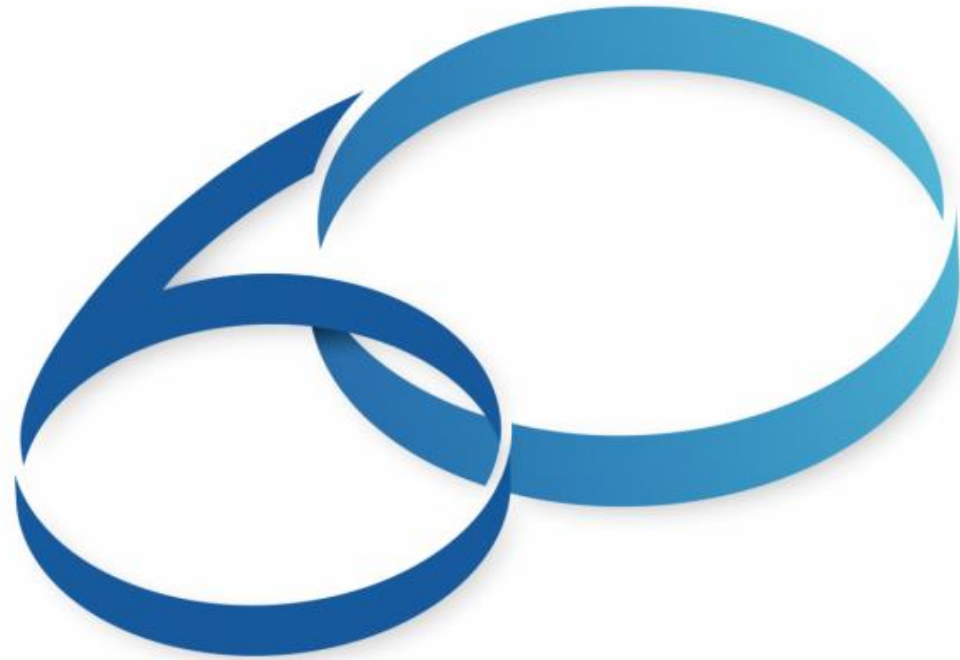


# CERN-GREECE INDUSTRY DAY

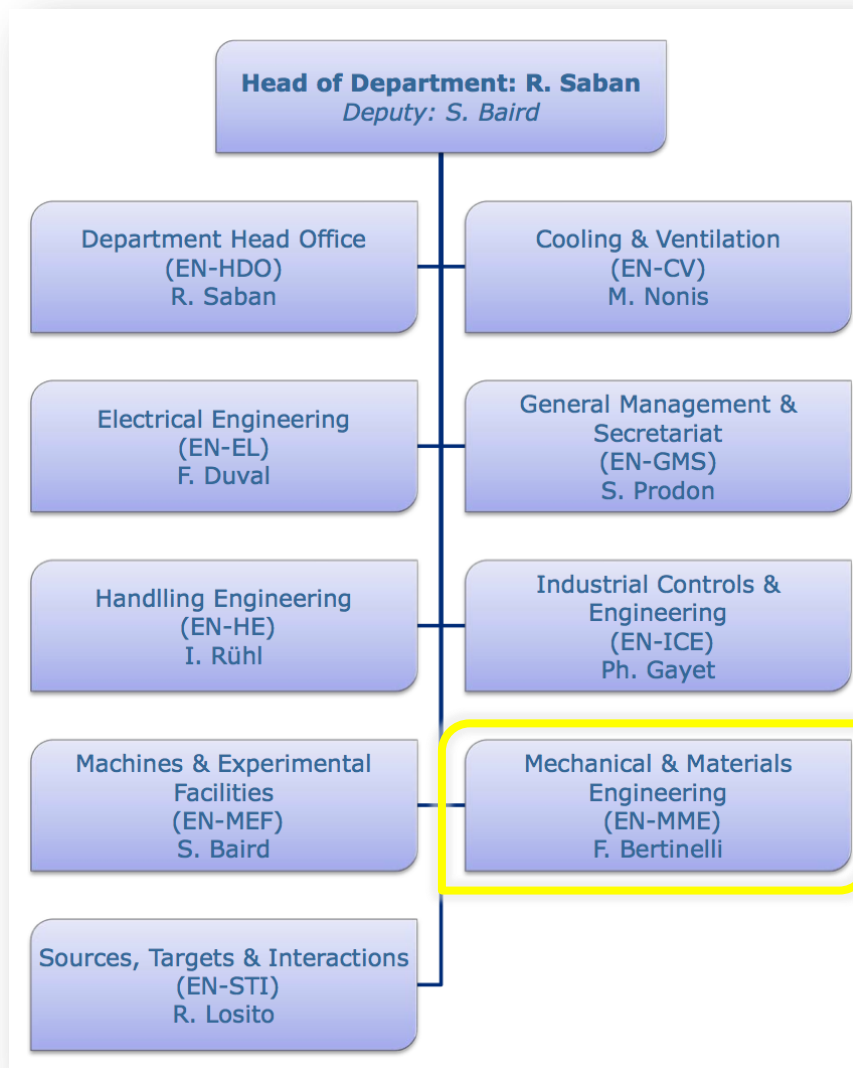
31/03/2014 – NCSR “Demokritos” Athens



YEARS/ANS **CERN**

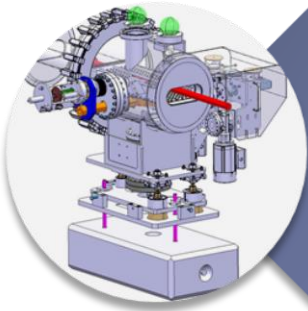
**A. Dallochio – Engineering Department**

# Engineering Dept. Structure



- Infrastructures
- Engineering
- Coordination
- Production

# EN-MME: Mechanical & Materials Engineering Group



## Engineering & Design

- Design Office:
  - 40 designers and engineers
  - CATIA / SmarTeam, ANSYS, LS-Dyna...
- Experimental Mechanics Lab.



## Production

- Mechanical workshop (4000 m<sup>2</sup>):
  - 50 technicians and engineers
  - CNC machining
  - Assembly & metal forming
  - Welding (TIG, MIG, electron beam, laser, vacuum brazing)
- **Technical Subcontracting Service**



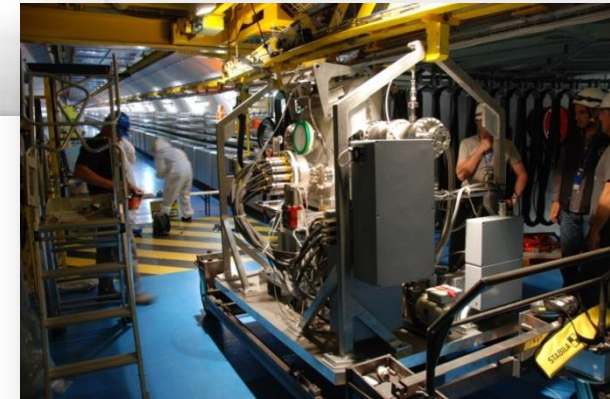
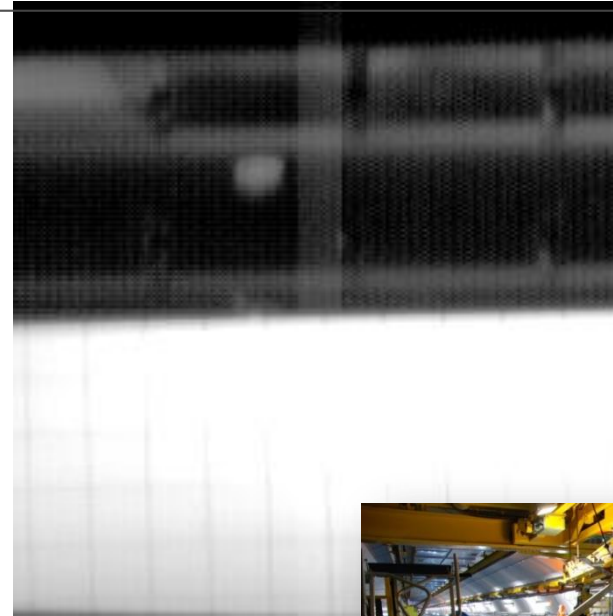
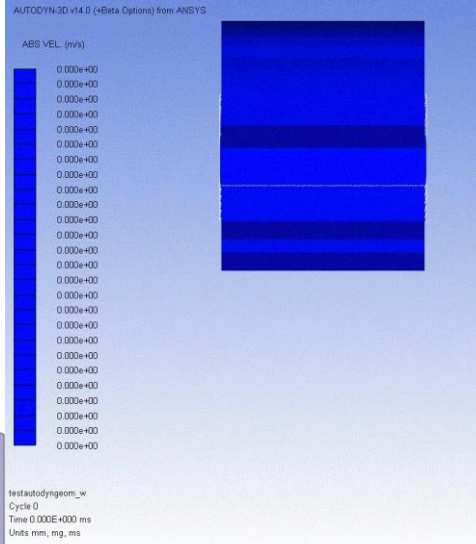
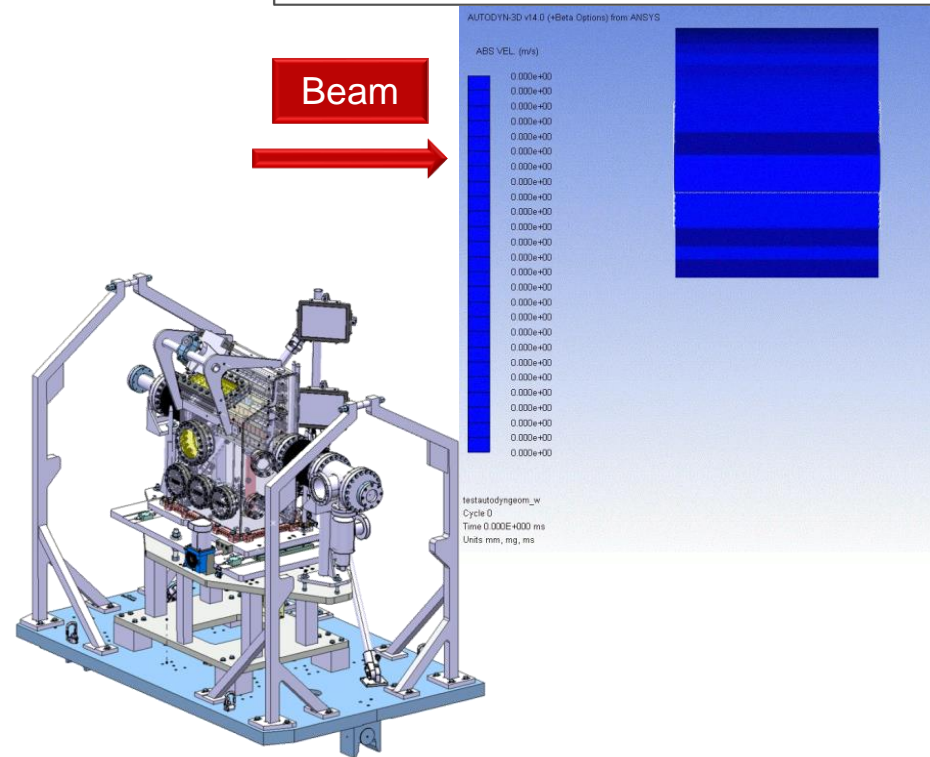
## Materials & Metrology

- Material science consultancy:
  - metallurgical analyses, microscopy, mechanical tests
- NDT: US, radiography, tomography
- Metrology: 350 m<sup>2</sup> lab. equipped with CMM.

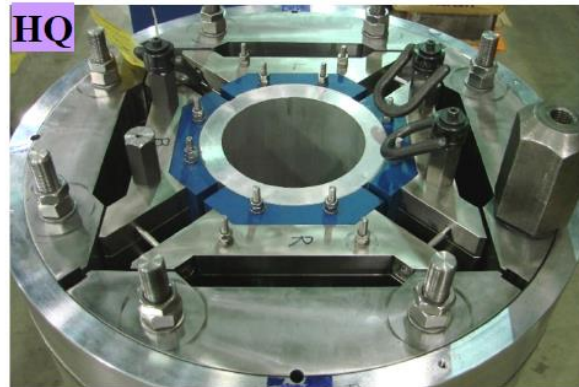
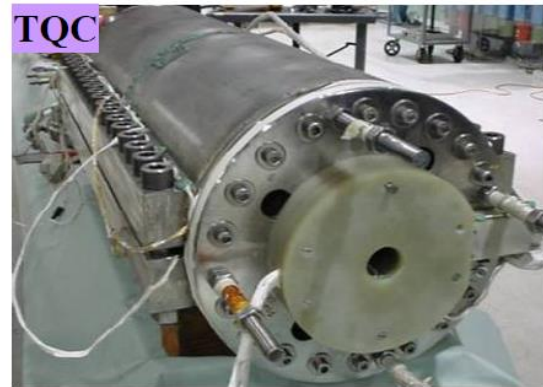
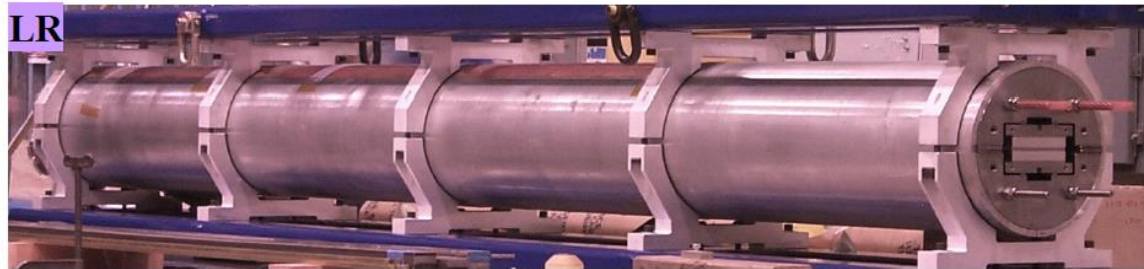
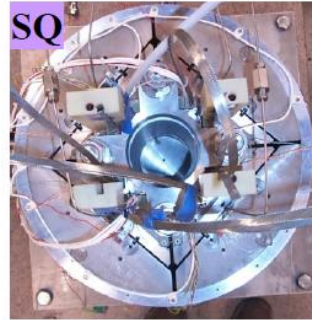
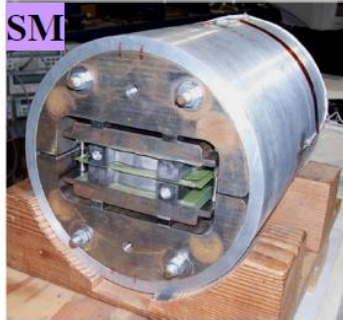
# EN-MME Mandate:

The mandate of the MME group is to provide to the CERN community specific engineering solutions combining mechanical design, production facilities and material sciences. This group owns, maintains and develops the 30 years old know-how on the mechanical construction of beam accelerators and physics detectors.

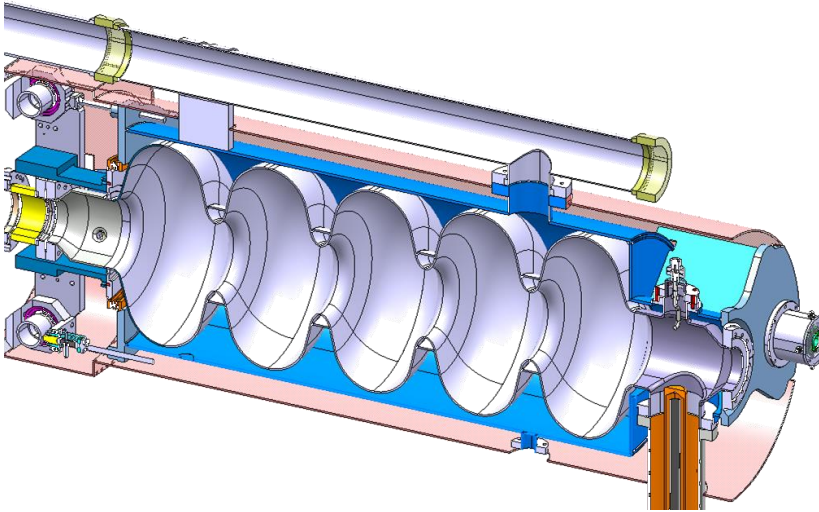
## Particle Beam Impact : comparison between simulation and experiment



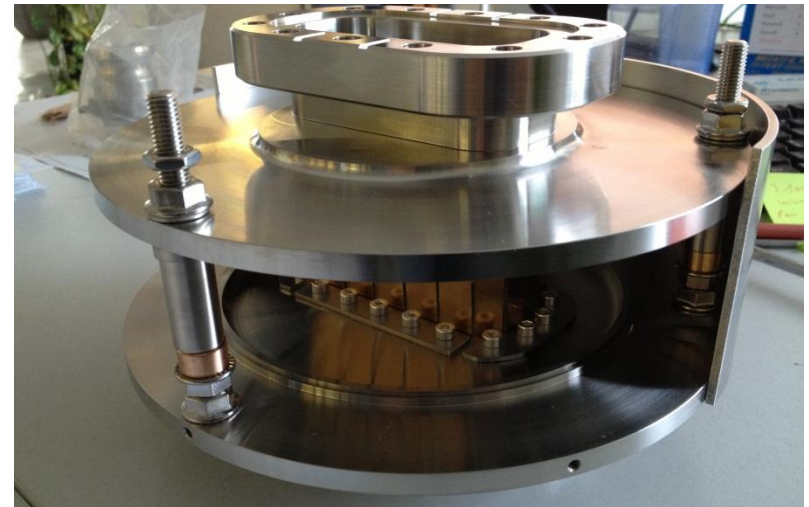
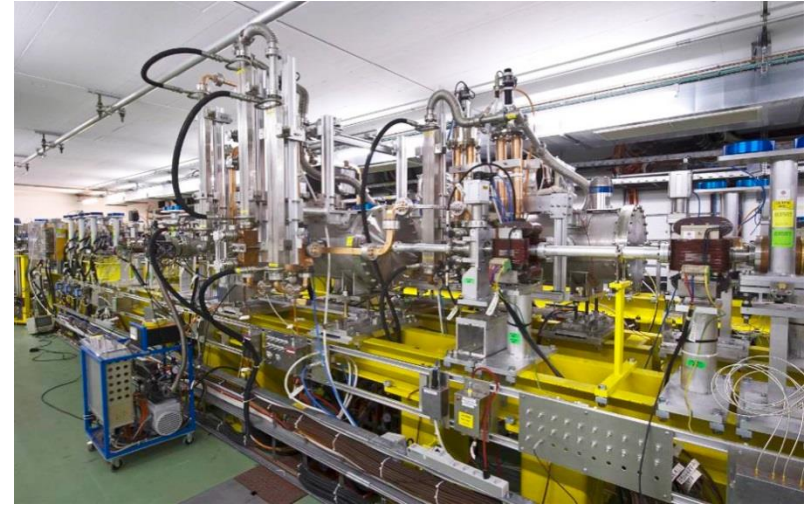
# Superconducting Magnets



# Superconducting RF Cavities



# Beam Lines



# Warm RF Cavities





# Vacuum Chambers



# MME Subcontracting Service:

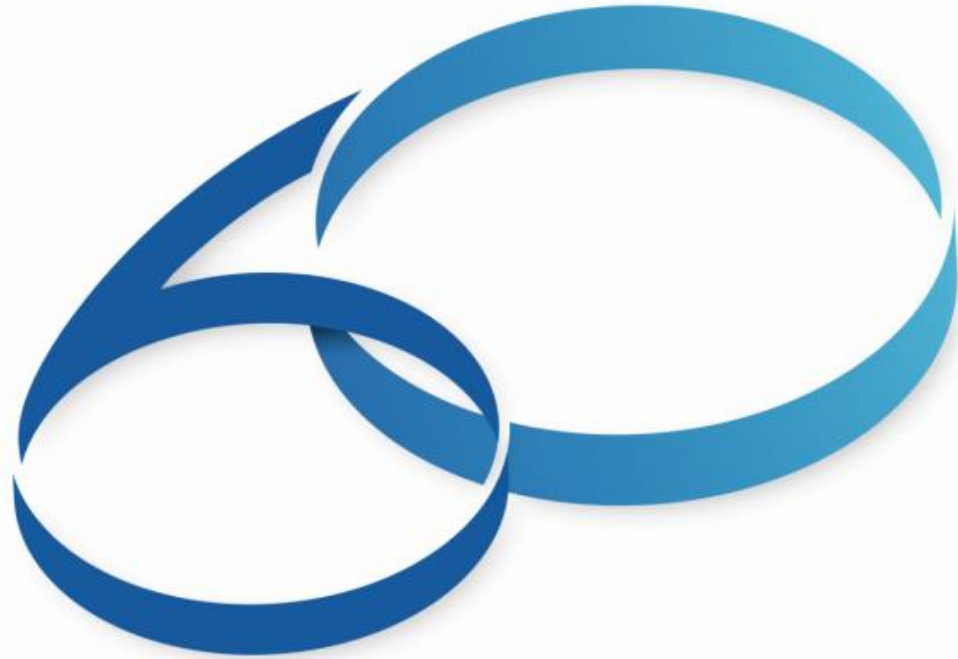
~1000 contracts/year in close collaboration with FP Dept.

		<i>Réels</i>	<i>Réels</i>	<i>Réels</i>	<i>Réels</i>		<i>Estimés</i>
		Facturé 2010	Facturé 2011	Facturé 2012	Facturé 2013		Charge restante 14/01/2014
<i>Activités de:</i>							
Bureau d'Etudes	(MCHF)	2.4	2.7	3.1	2.8		1.8
Soustraitance	(MCHF)	3.8	5.9	7.0	7.9		5.7
Fabrication	(MCHF)	2.6	3.5	4.3	5.7		3.7
<b>Totale</b>	<b>(MCHF)</b>	<b>8.8</b>	<b>12.1</b>	<b>14.4</b>	<b>16.4</b>		<b>11.2</b>

# MME Subcontracting Service: what kind of company are we looking for?

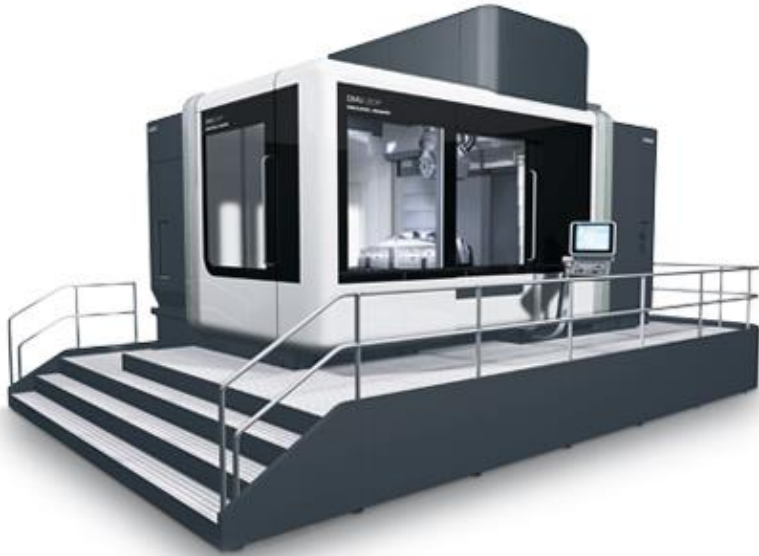
Sector	Main products	Available technology
UHV-XHV (Vacuum)	Vacuum chamber; Flanges	TIG welding; EB welding; Vacuum Brazing
UHV-XHV (Vacuum)	Bellows;	TIG welding; EB welding;
General machining	Frame (construction steel, stainless steel and aluminium)	Welding (at least 3 meter long) Milling Painting
Precision machining (+/- 0.02)	Machined parts (construction steel, stainless steel and aluminium; Cu alloys)	Milling, turning, grinding (500x500x500mm)
Sheet metal forming		Cutting (laser, water, plasma) Welding Bending
Ceramic	Aluminium Oxide Zirconium Oxide Silicon Carbide Silicon Nitride	Machining Surface treatment
Machining	Exotic materials (tantalum, tungsten, molybdenum, carbon)	Milling, turning, grinding

**Thank you for your attention**



YEARS/ANS **CERN**

# MME Workshop



# MME Metrology

## CONTACT PROBE MACHINE

Ferranti

Olivetti

Leitz Infinity

## OPTICAL PROBE MACHINE

Wegu

Mahr

## PORTABLE 3D MEASURING ARM

Romer

## ROUGHNESS – TOPOGRAPHY – PROFILE

MITUTOYO SJ 301 (Portable)

MITUTOYO FORMTRACER SV-C3100 H4

## NON-CONTACT INTERFEROMETRY

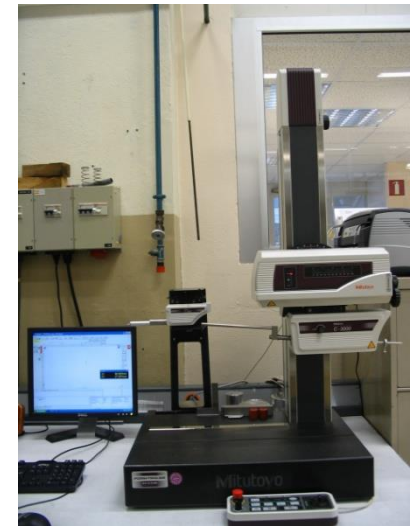
VEECO NT 3300

## OTHER MEASURES

Linear measurements, straightness,  
flatness, squareness, ...

## PROFILE PROJECTOR

BATY R770



# MME Metallurgy

Scanning Electron Microscopy

LEICA STEREOSCAN 360

LEO (Zeiss) 430

Optical Microscopy

LEICA Q600 (Quantimet) Image Processing

LEICA MZ 16 Stereomicroscope

Mechanical Testing

UTS 200, Tensile Testing at room temp.

UTS 200, Tensile Testing at 1.9 K.

Macro Hardness testing

Micro hardness testing

Siemens D-5000 X-Ray Diffractometer

Non-destructive Testing

Ultrasonic Test (USIP)

USN60

USOUND (immersion)

Radiography

Ultrasonic swinger device



# CERN Procurement Guidelines

<u>Requests up to 1 kCHF</u>	<ul style="list-style-type: none"> <li>•1 bid by Technical Officer</li> <li>•<u>Purchase Requisition (DAI)</u></li> </ul>
<u>Requests between 1 and 5 kCHF</u>	<ul style="list-style-type: none"> <li>•1 written bid by Technical Officer</li> <li>•<u>Purchase Requisition (DAI)</u></li> <li>•Validated by Procurement Officer</li> </ul>
<u>Requests between 5 and 10 kCHF</u>	<ul style="list-style-type: none"> <li>•Price enquiry by Technical Officer or Procurement Officer</li> <li>•Minimum of 3 bids requested</li> <li>•<u>Purchase Requisition (DAI)</u> made to the lowest compliant bidder</li> </ul>
<u>Requests between 10 and 50 kCHF</u>	<ul style="list-style-type: none"> <li>•Technical specification provided by Technical Officer</li> <li>•Price enquiry made by Procurement Officer</li> <li>•3 to 5 bids requested</li> <li>•<u>Purchase Requisition (DAI)</u> made to the lowest compliant bidder</li> </ul>
<u>Requests between 50 and 200 kCHF</u>	<ul style="list-style-type: none"> <li>•Departmental Request</li> <li>•Price enquiry by Procurement Officer</li> <li>•3 to 5 bids requested</li> <li>•<u>Purchase Requisition (DAI)</u> made to the lowest compliant bidder</li> </ul>
<u>Requests between 200 and 750 kCHF</u>	<ul style="list-style-type: none"> <li>•Departmental Request</li> <li>•Market Survey followed by Invitation to Tender</li> </ul>
<u>Requests above 750 kCHF</u>	<ul style="list-style-type: none"> <li>•Departmental Request</li> <li>•Market Survey followed by Invitation to Tender</li> <li>•Finance Committee approval</li> </ul>



# EN- CV: Cooling & Ventilation

- Hydraulic Systems:
  - Water cooling: particle accelerators, experimental facilities, calculation centers, labs...
  - Water distribution & special firefight water line
- Air cooling and air conditioning systems:
  - CERN-wide including underground installation.
  - Pneumatic distribution lines.

# EN-CV

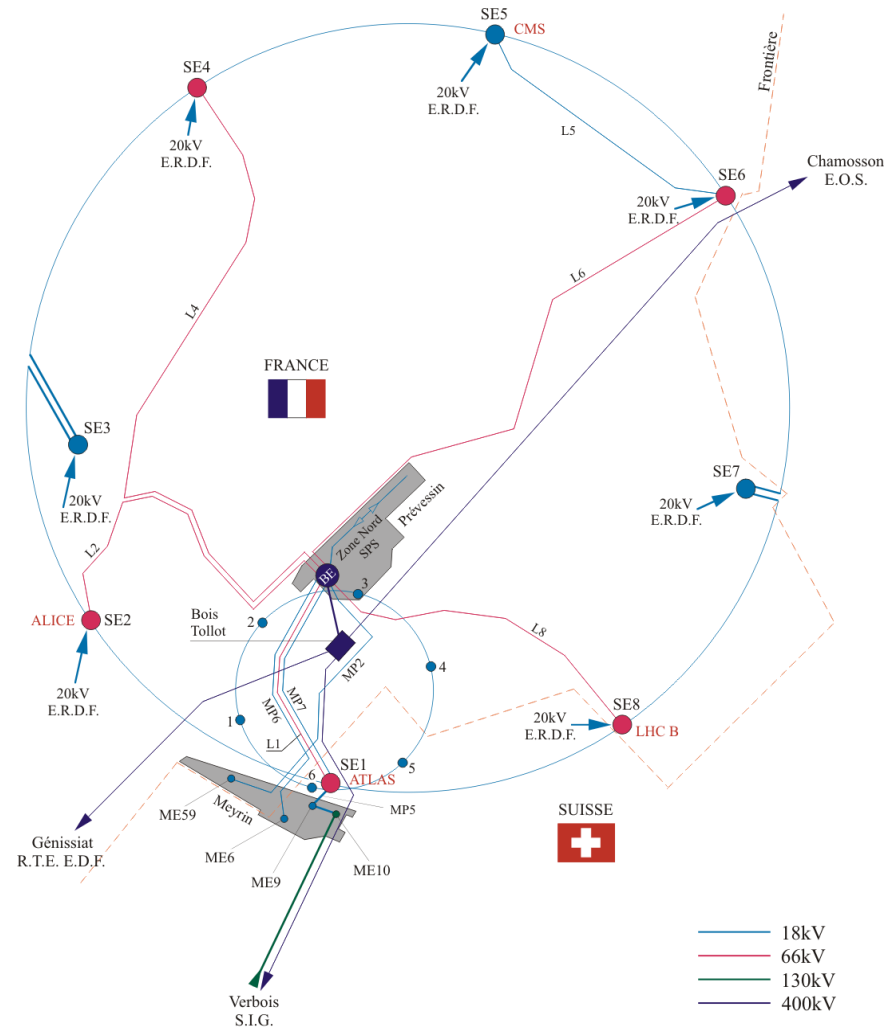
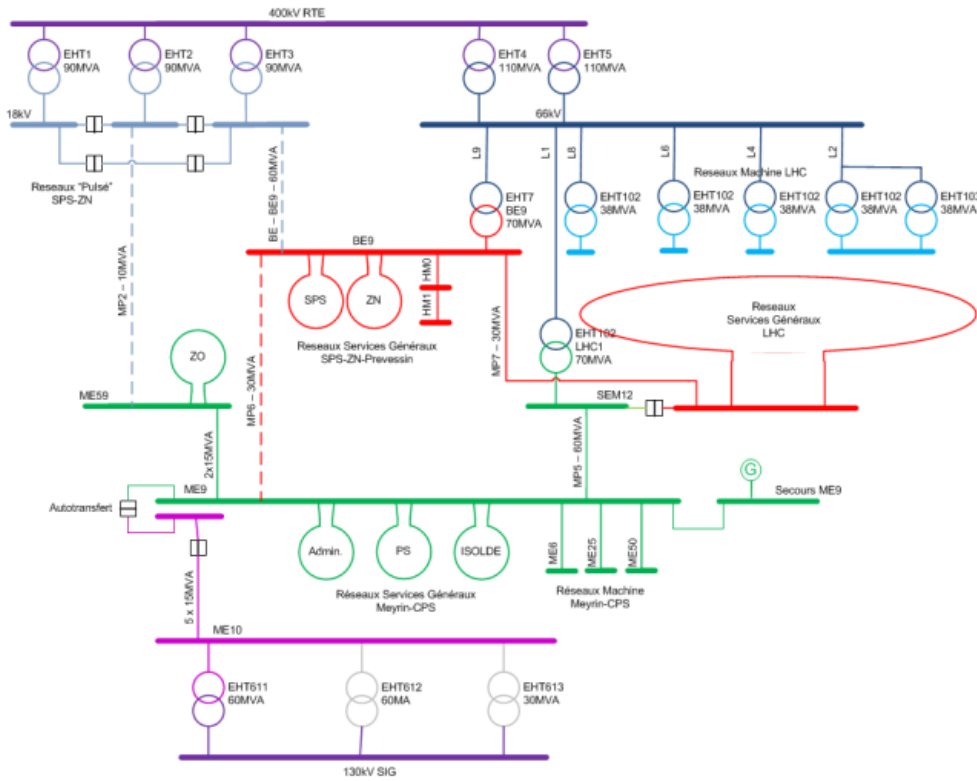
22	Cooling Towers (450 MW)
35	Cold Water station 6-12°C (73 MW)
150	Cooling station (water, demineralized water, C <sub>3</sub> F <sub>8</sub> , C <sub>6</sub> F <sub>14</sub> )
800 km	Piping
5'400 m <sup>3</sup> /h	Water distribution



*Water consumption equivalent  
to a city of 45'000 people  
10% consumption of the  
Canton de GENEVE*



# EN-EL : Electrical power distribution

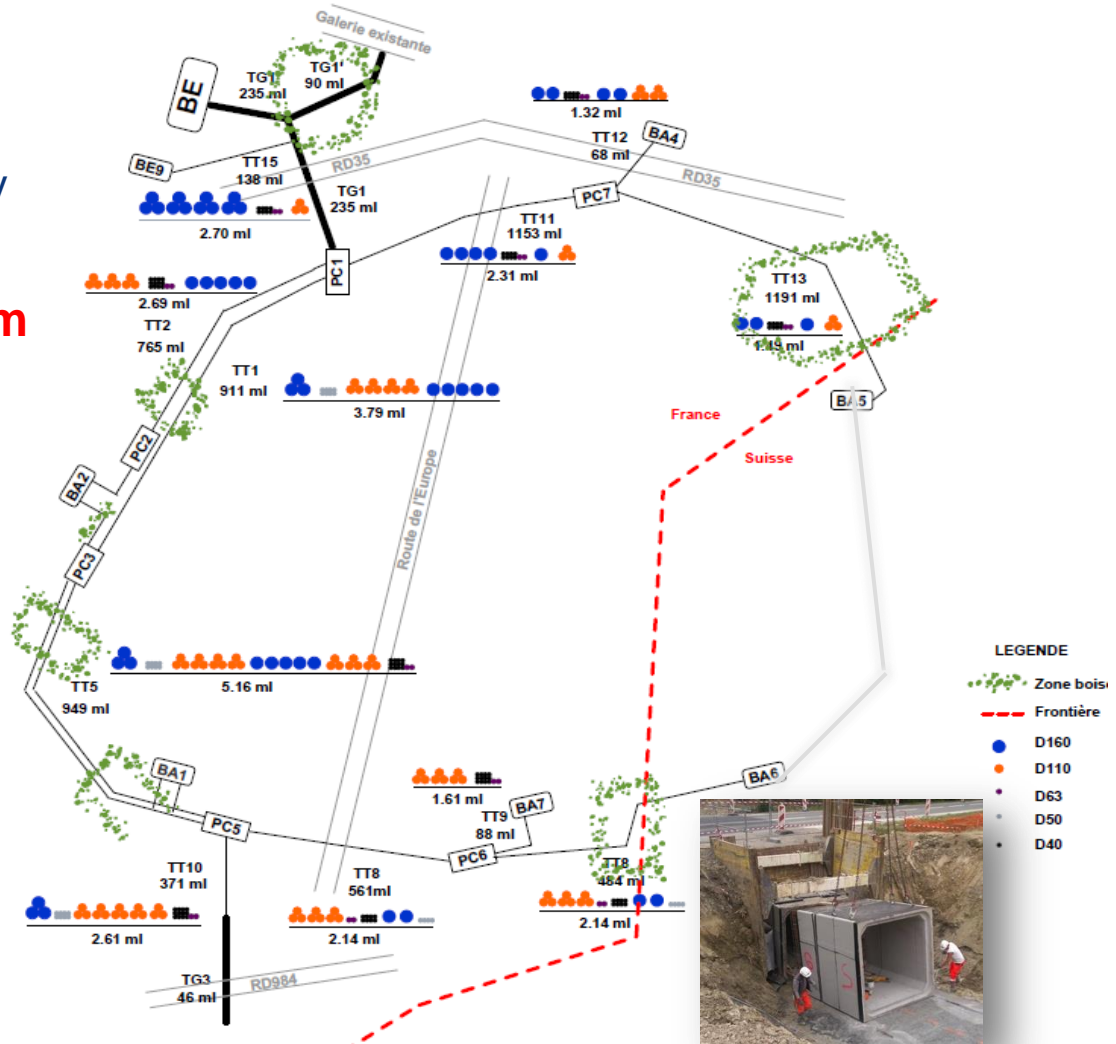


Year Consumption	1.2 TWh
P max	200 MW

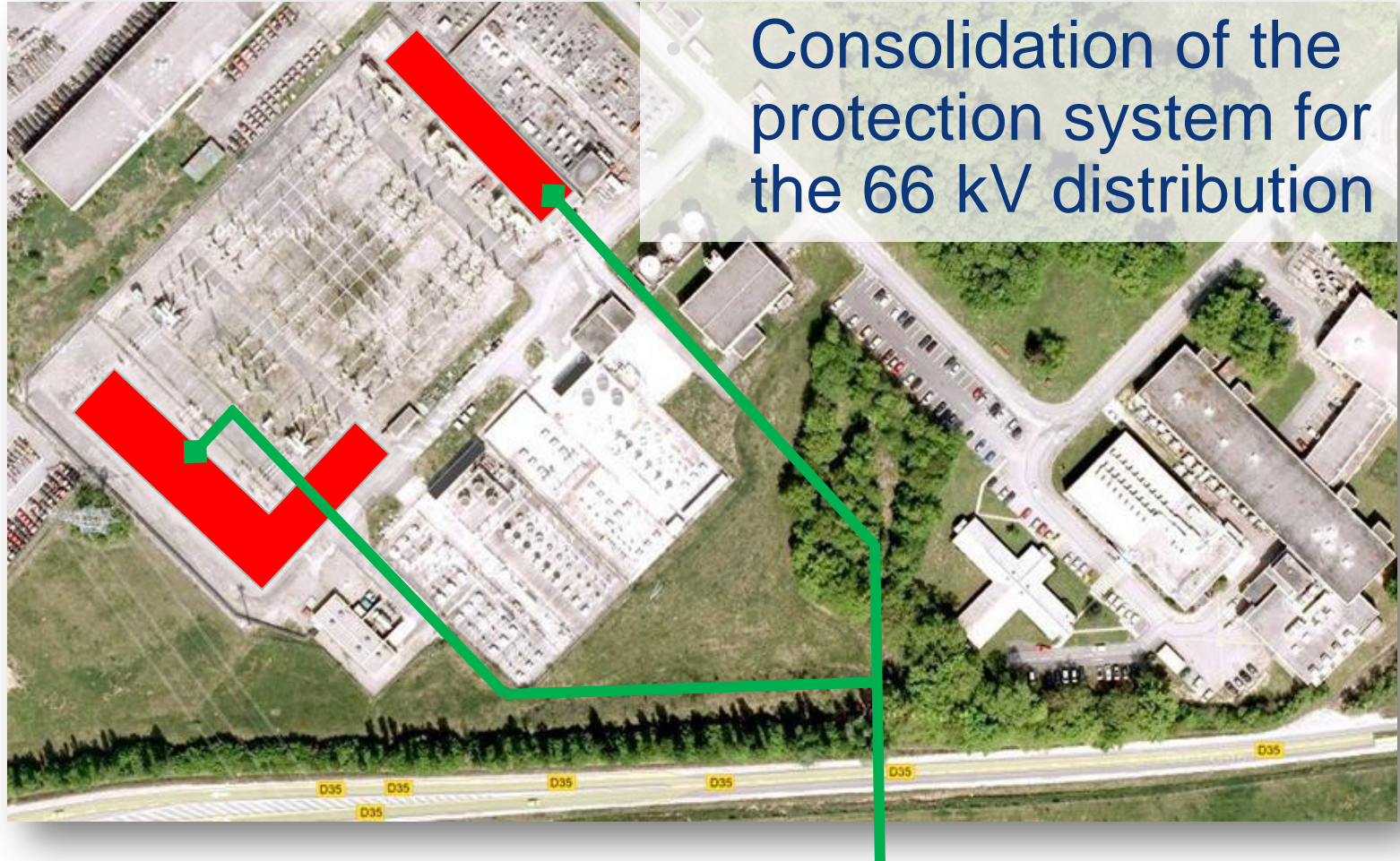


# EN-EL : on-going projects

- SPS cables upgrade
  - Potenza 3.3/18/66 kV
  - Controlli
- $\approx$  **90 km** divided in **7 km** sectors

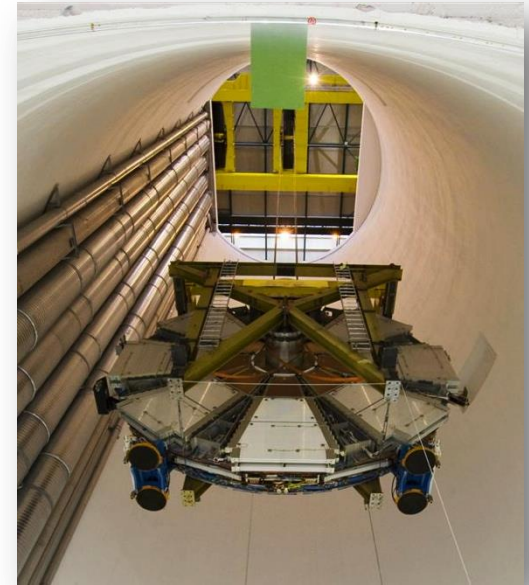


# EL : progetti futuri



# EN-HE : transport & handling

- Management of the complete logistic for transport & handling CERN-wide
- Design, purchase, operation and maintenance of all transport & handling machines.



# HE : industrial vehicles

- 30 elevators (diesel) +150 electrical elevators
- 100 platforms
- 1000 manual handling machines
- 60 trucks for special transport
- 180 electrical trolleys

TOTAL : 1500 machines (Value 25 M€)

