



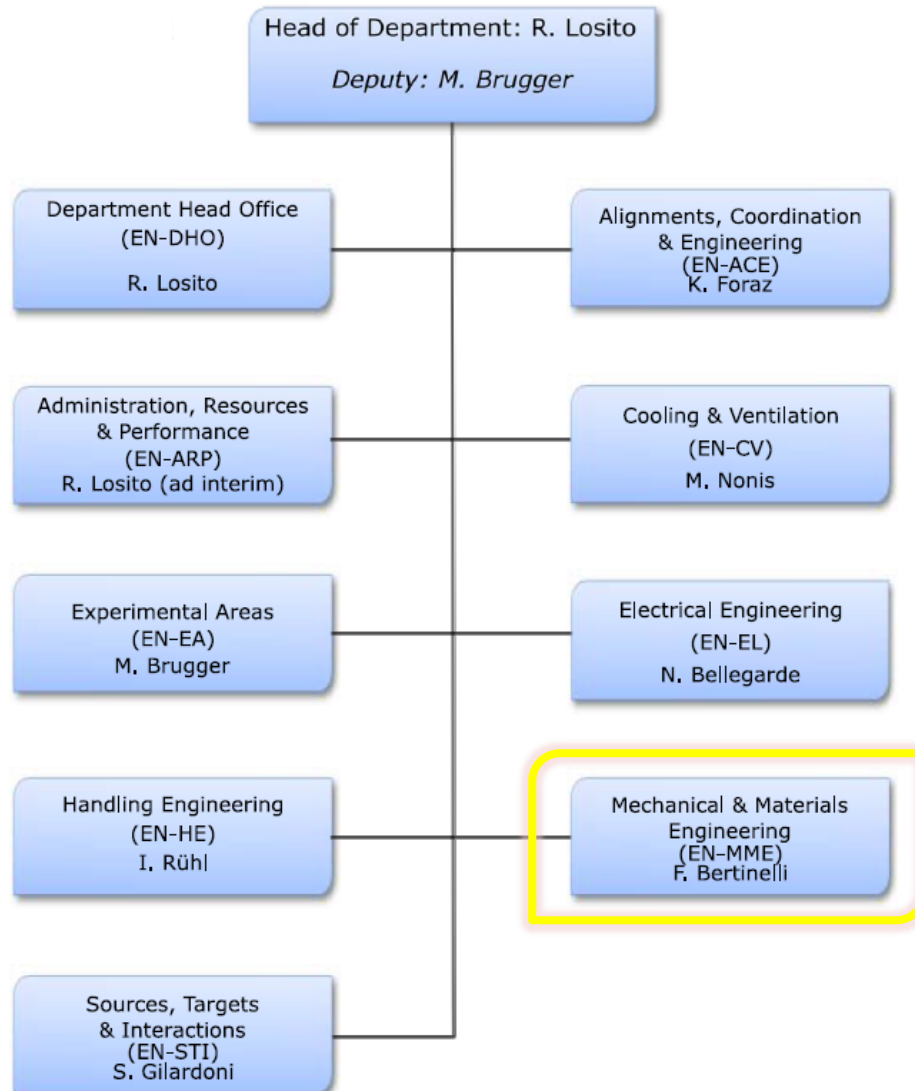
Confindustria Ancona @ CERN: Commesse industriali e sfide tecnologiche nel settore meccanico al CERN

30/09/2016 - CERN, Geneva (CH)

M. Garlaschè on behalf of EN-MME

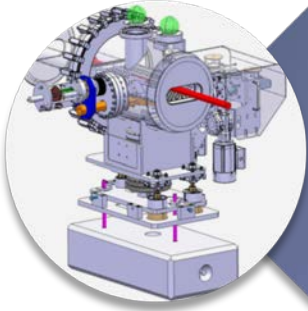


Engineering Dept. Structure



- 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 m²):
 - 50 technicians and engineers
 - CNC machining
 - Assembly & metal forming
 - Welding (TIG, MIG, electron beam, laser, vacuum brazing)
- Technical Subcontracting Service



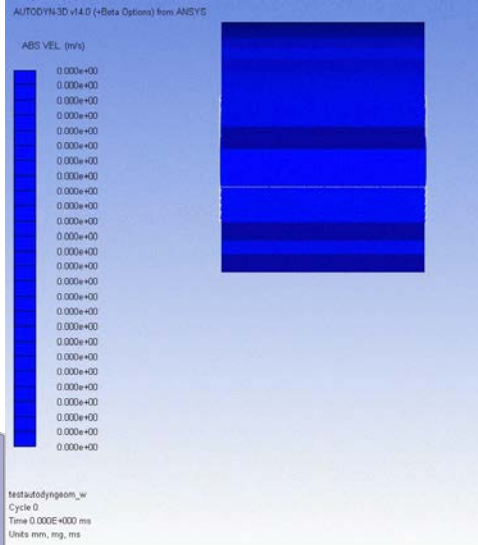
Materials & Metrology

- Material science consultancy:
 - metallurgical analyses, microscopy, mechanical tests
- NDT: US, radiography, tomography
- Metrology: 350 m² lab. equipped with CMM.

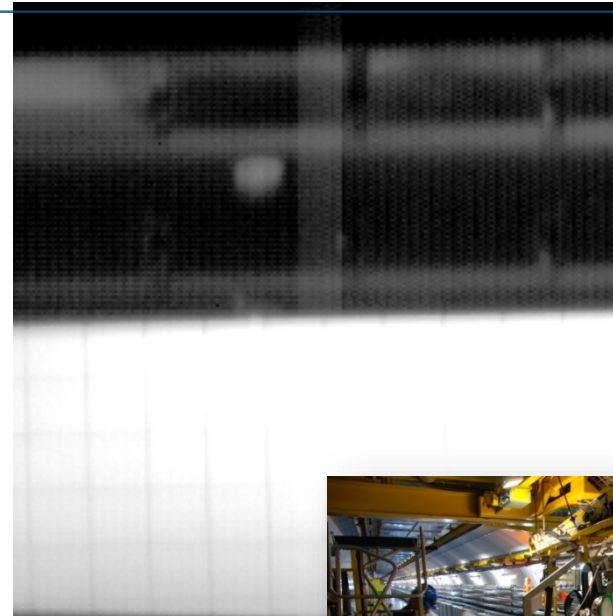
EN-MME Mandate:

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.

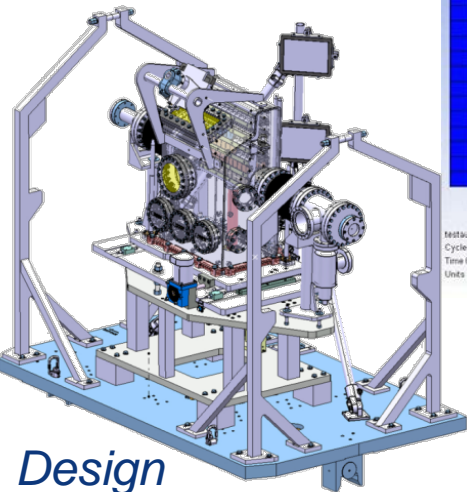
Particle Beam Impact : comparison between simulation and experiment



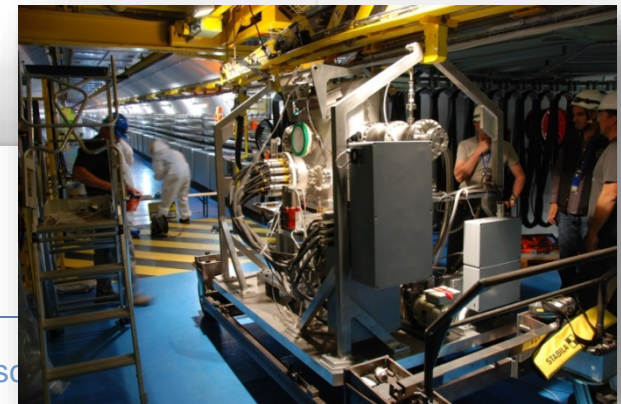
F.E. Calcs



Live Acquisition system by Mech. Lab



Design



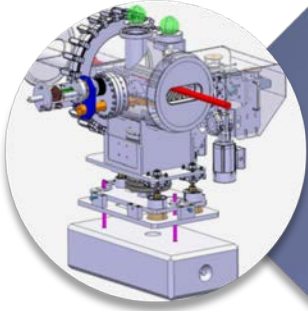
Manufacturing



30/09/2016

M. Garlasco

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- **Technical Subcontracting Service (MME-FS)**



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Subcontracting Service:

	Invoiced Jobs				
	2011	2012	2013	2014	2015
<i>Subcontracting MME-FS (MCHF)</i>	5.9	7.0	7.9	9.0	8.2

~2000 contracts/year in close collaboration with FP Dept.

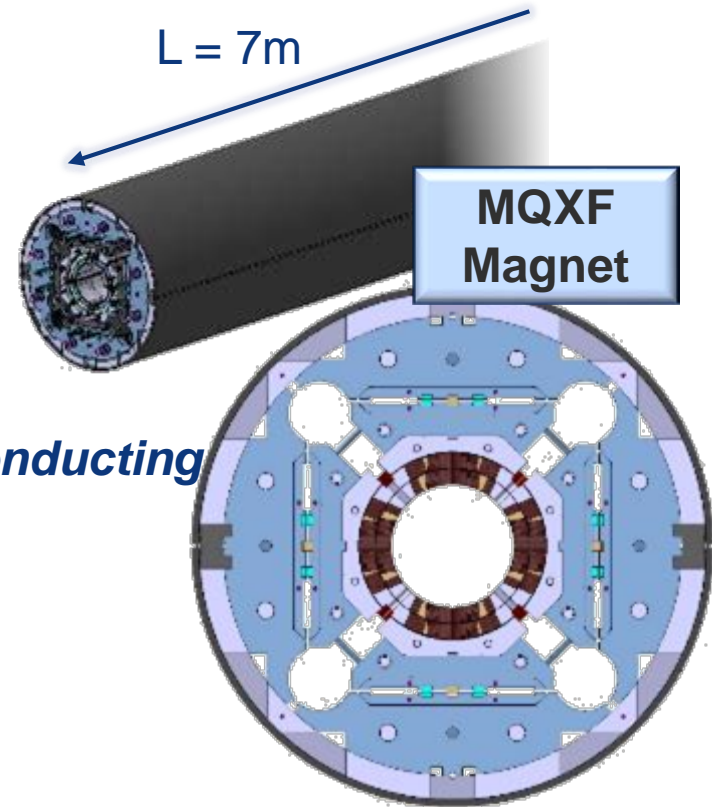
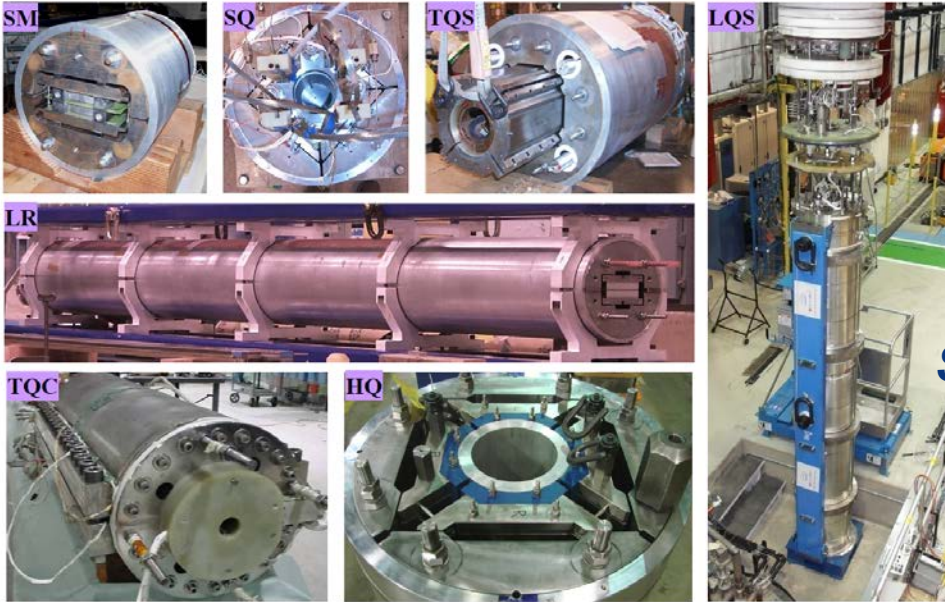
Quota represents ~ 40% of overall production for mechanical components @ CERN

Subcontracting:

- ~ 35% of semi-finished parts**
- ~ 65% of finished / turnkey components**

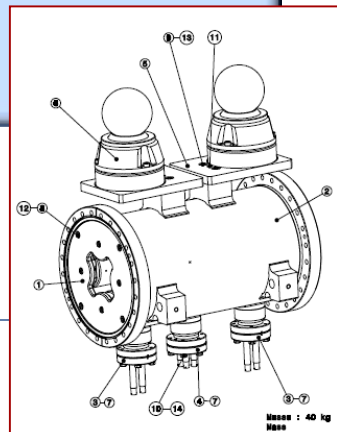
MME Subcontracting Service: Core & recent activities Europe wide

Magnets



Superconducting

ELENA – Series production of electrostatic quadrupoles (x60). Synergy between EN-MME Workshop and NO-RS suppliers.



Prototypes & small series of different magnets

- High precision CNC of small to large equipment
- Stamping, wire cut of laminations
- Cryostats

SC Magnets: Tools

Large Precise Tools for Magnet assembly

MQXF

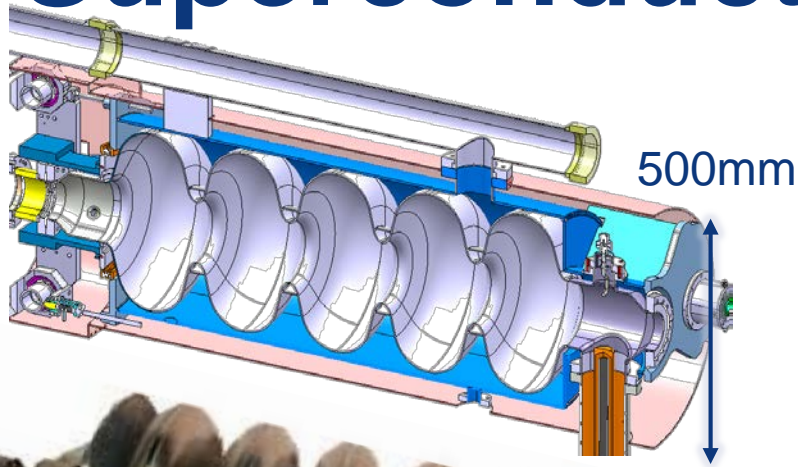


Rotating Table for SC magnets assembly



FRESCA: Magnet impregnation tool.
(BE Supplier)

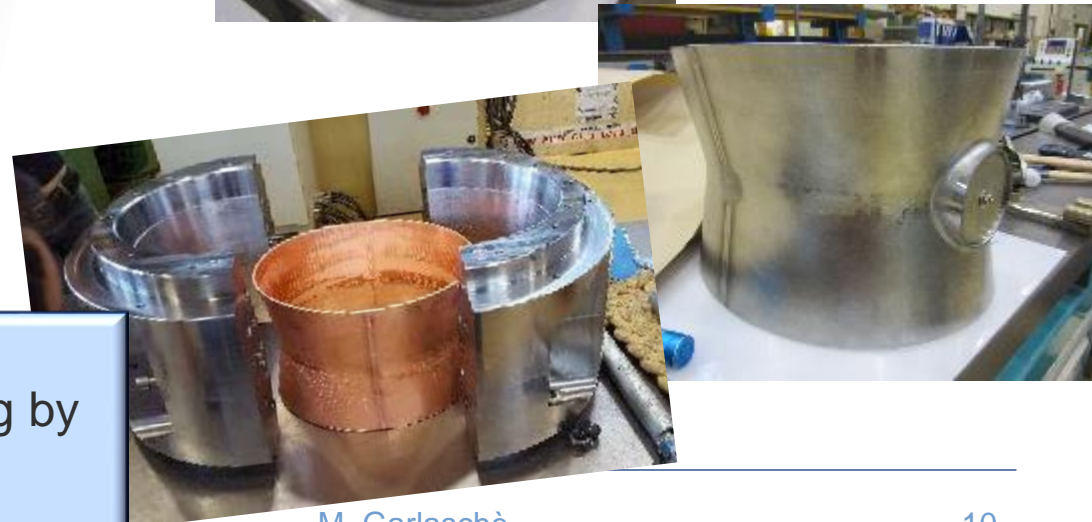
Superconducting RF Cavities



Forming of Niobium Sheets
Precision and surface quality of utmost importance for cavity performance



SPL Cavity
..Spinning..



CRAB Cavity
..Punching, extrusion, deep drawing by MME..
Precise Tools

Warm RF Cavities



First DTL girder

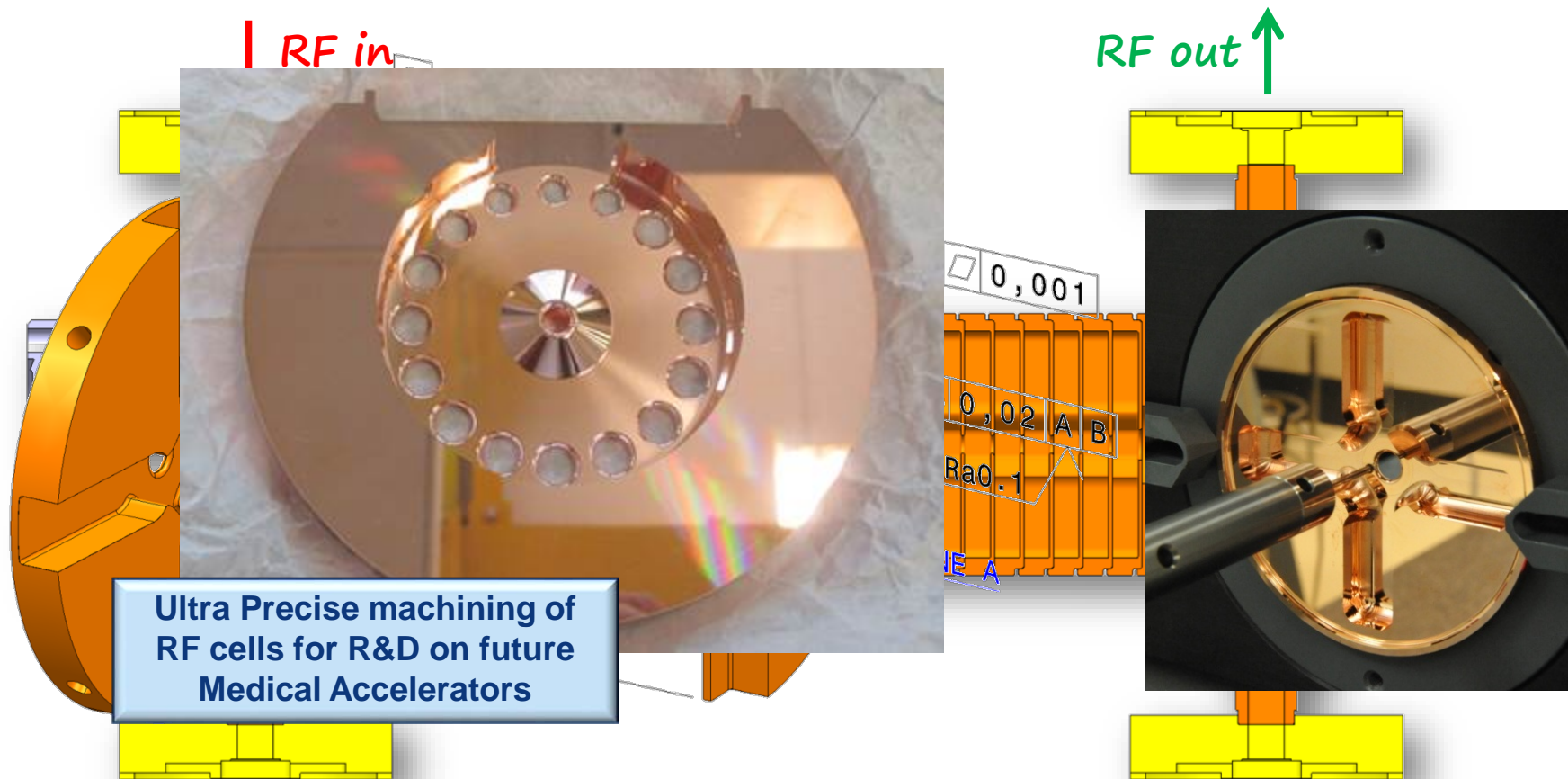


First full scale DTL tank segment (~2 m)

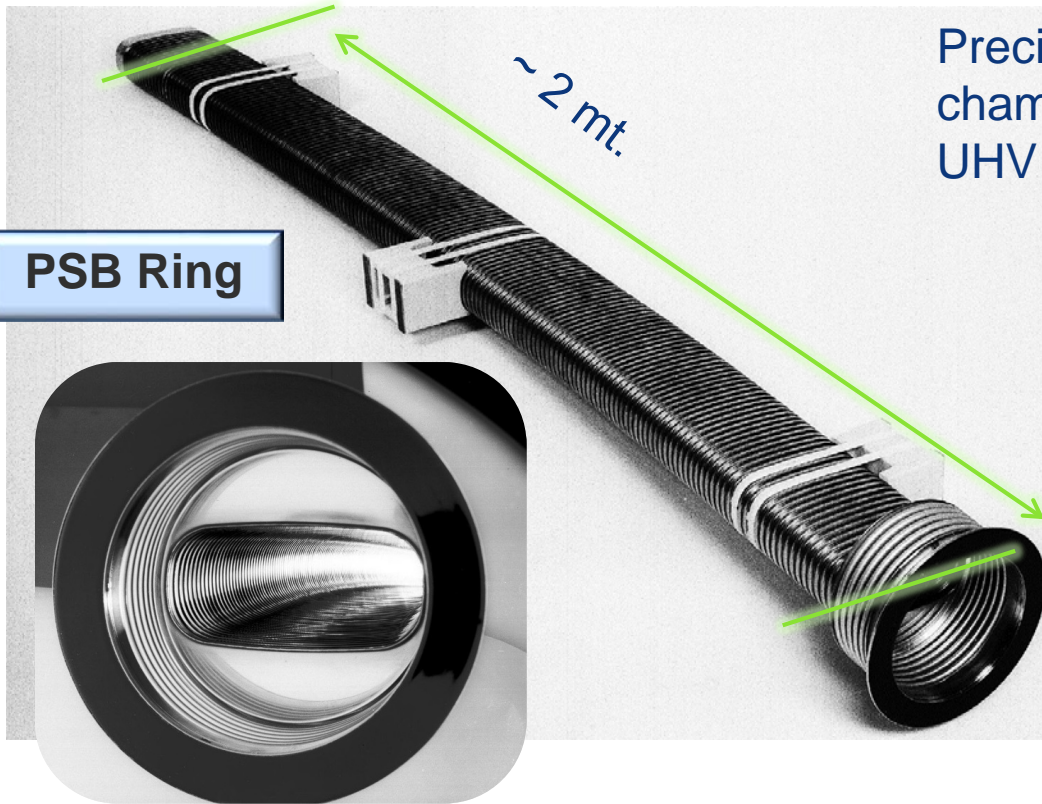
Precise Machining of Large Equipment

Ultra precise machining

The design involves coupled RF cavities to transfer energy from a high-current, low-energy drive beam to a low-current, high-energy beam to be used in collisions.

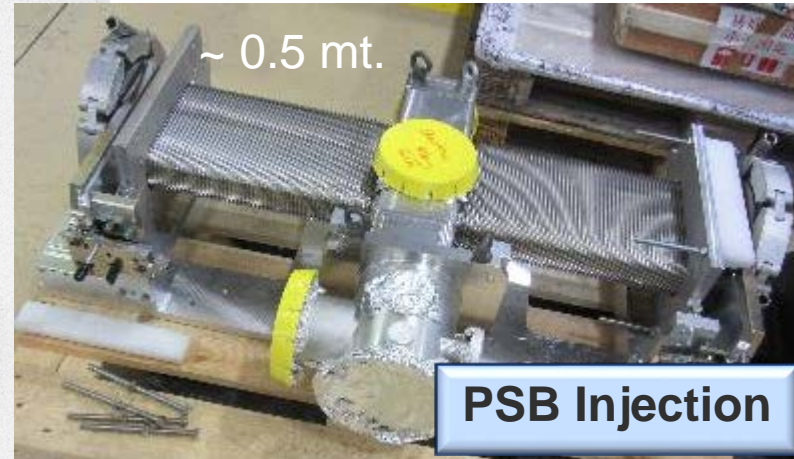


Vacuum Chambers



PSB Ring

Precise Shaping of Inconel & SS alloys into chambers of different sizes
UHV Compliant Manufacturing



PSB Injection

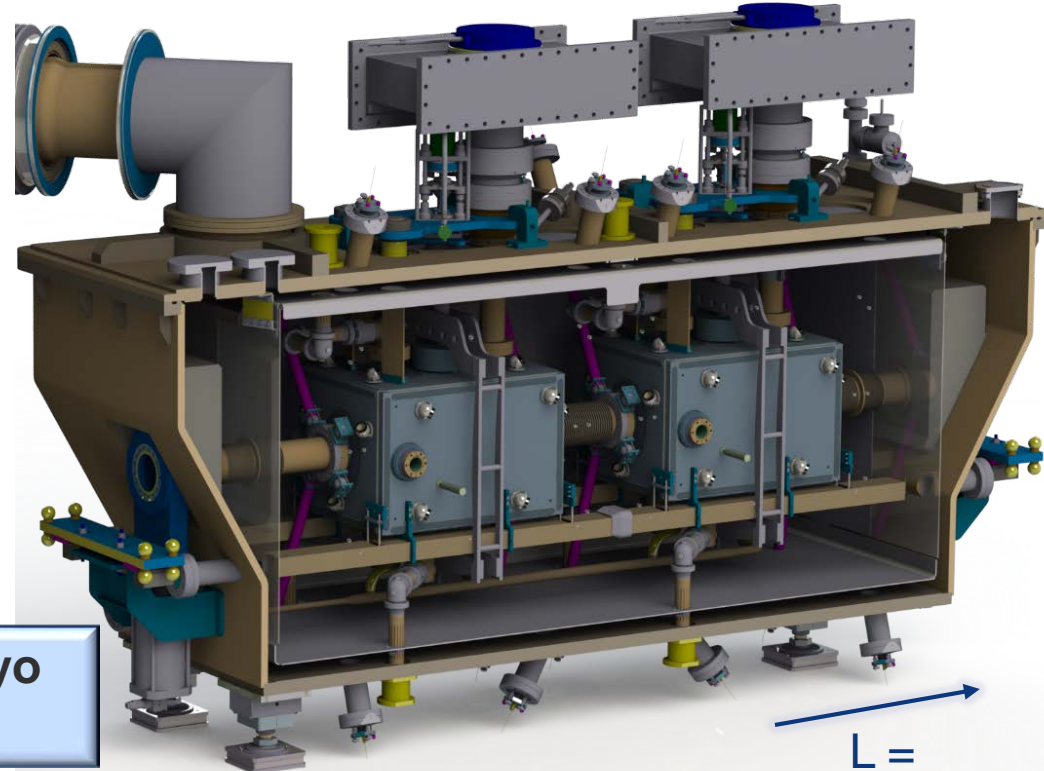
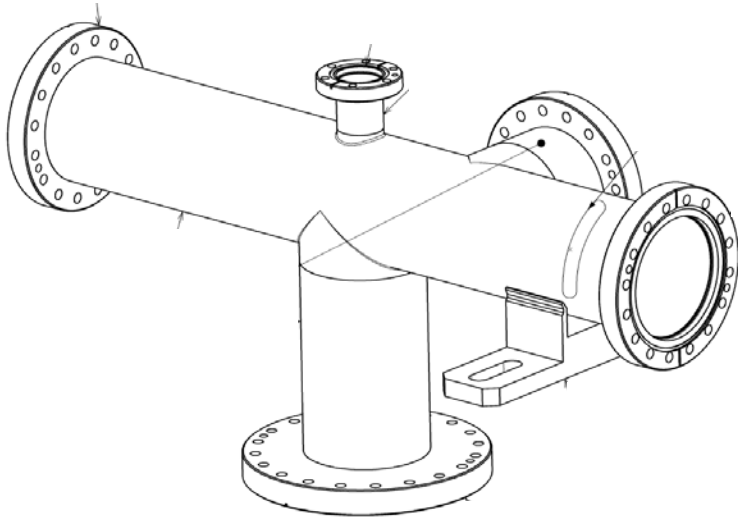


Hippodrome Edge welded bellows



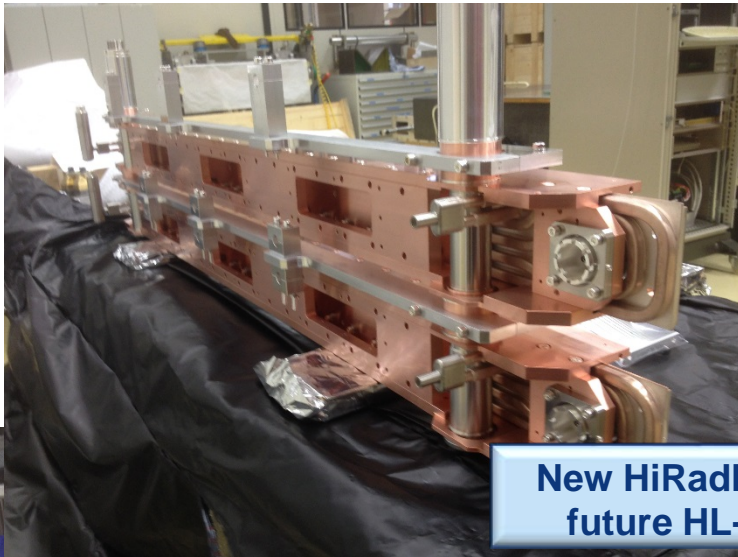
Vacuum Chambers

Shaping / Extrusion / Welding of UHV
Stainless steel Chambers & Vessels

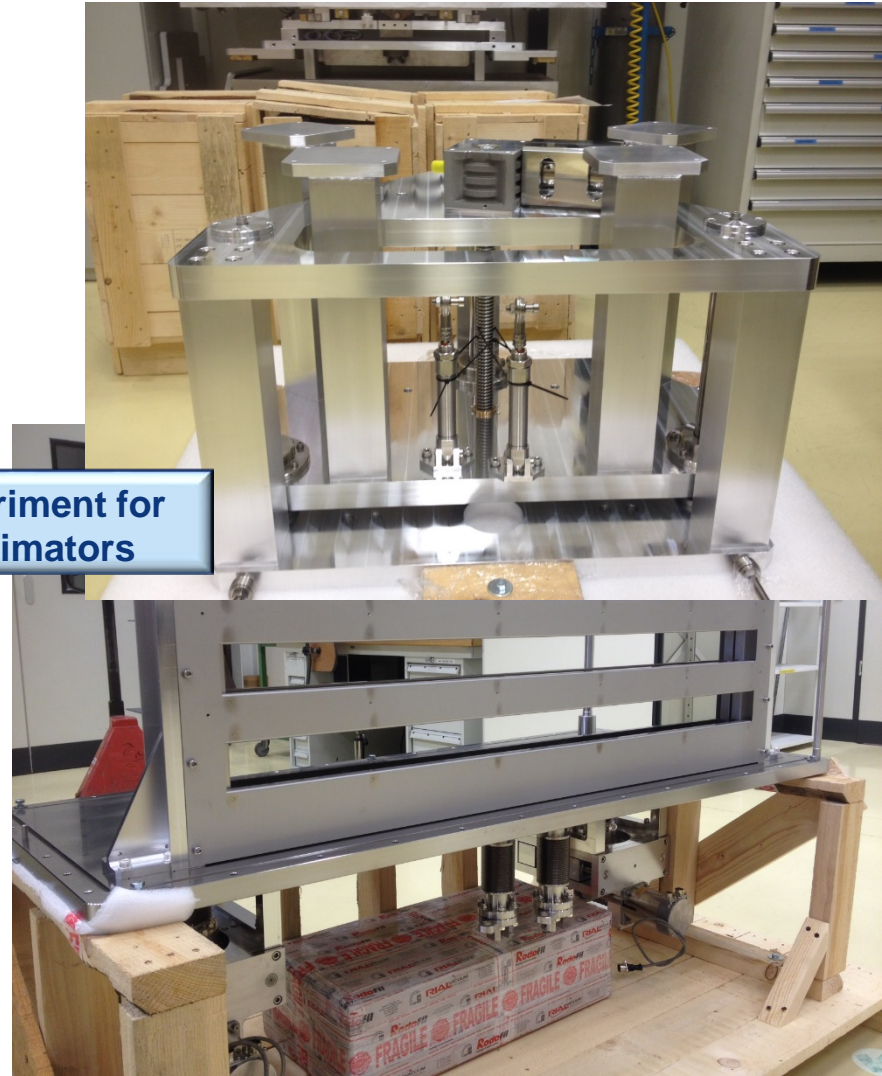
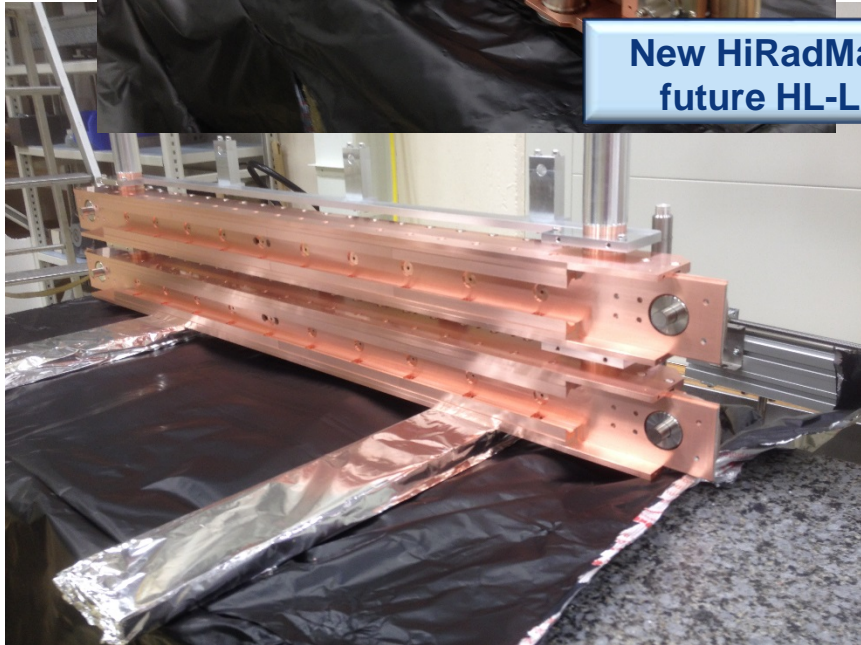


**Crab Cavity Cryo
Vessel**

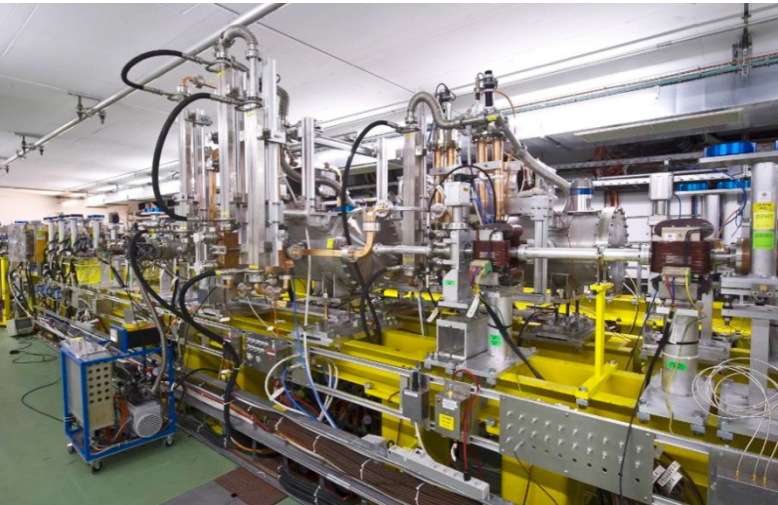
Collimators:



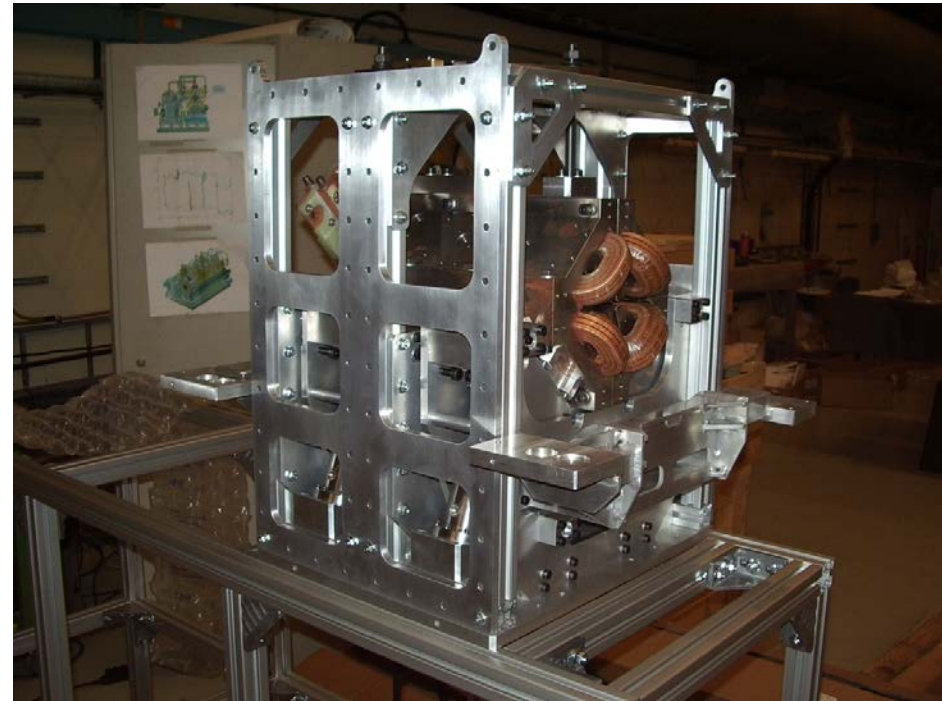
New HiRadMat Experiment for future HL-LHC Collimators



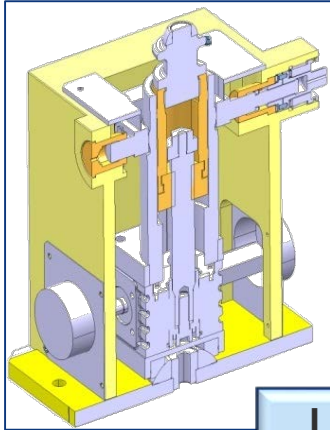
Beam Lines & Positioning Systems



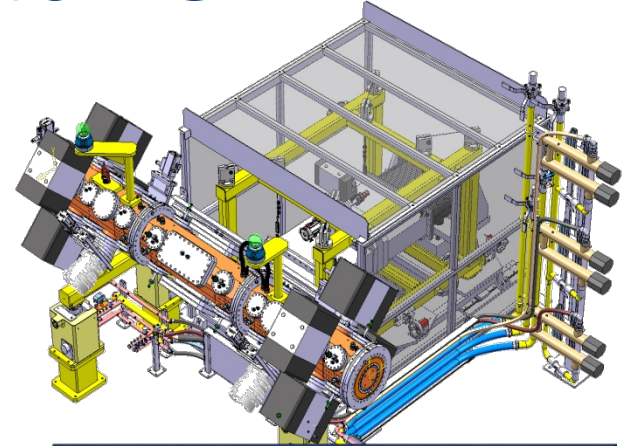
Alignment for small particle detector



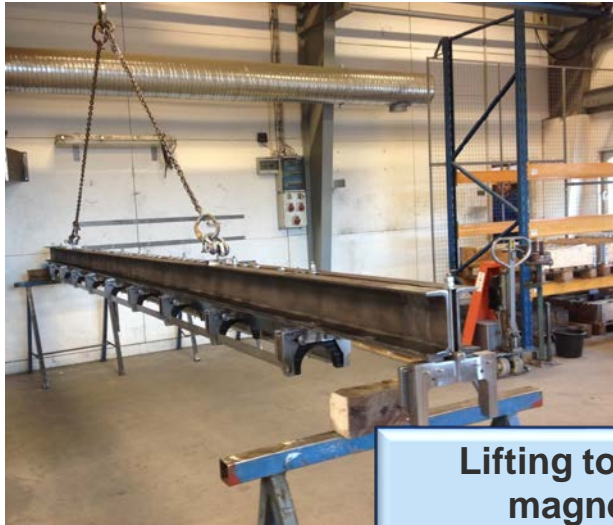
Transport & Support Systems



Linac 4 jacks



RFQ detailed assembly including ridge-line support and cooling distribution

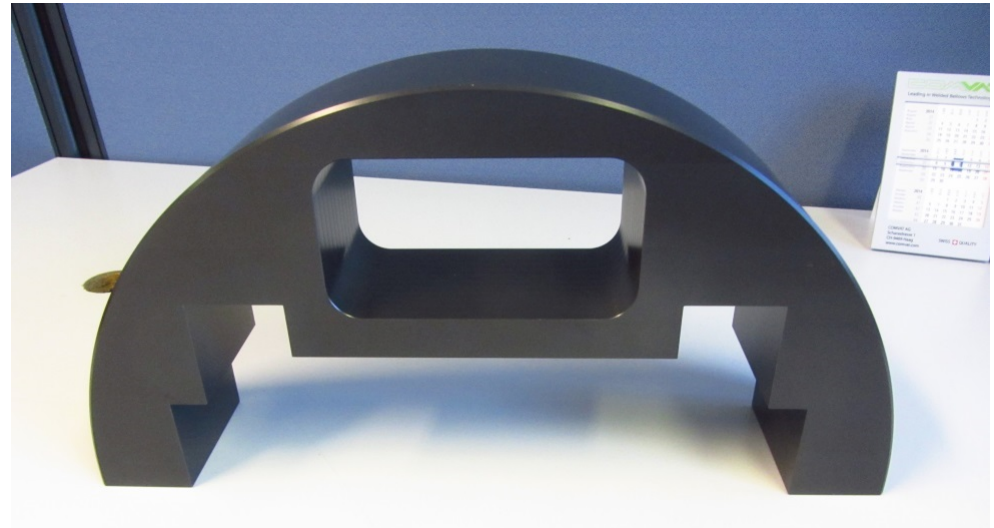
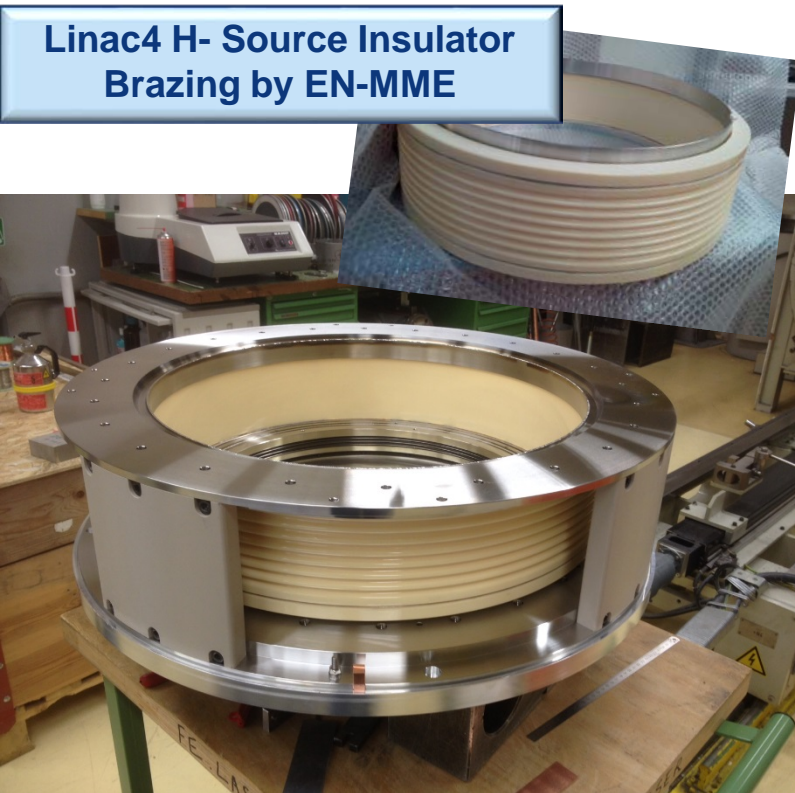


Lifting tool for magnets

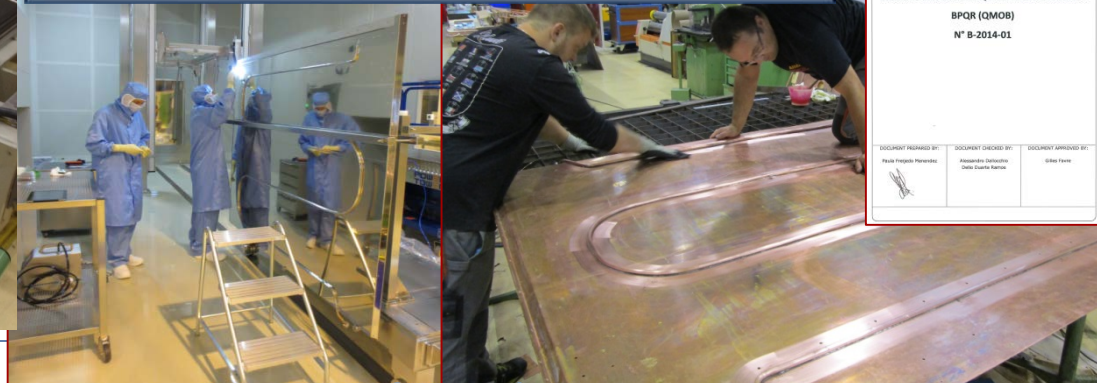


MME Subcontracting Service: recent activities Europe wide

**Linac4 H- Source Insulator
Brazing by EN-MME**



**HIE-ISOLDE Thermal Shield.
Produced by EN-MME (Design TE-MS).
Ni-Plating in collaboration with FR firm**



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23016196		
Engineering Department		
Date: 2014-01-01		
BRAZING PROCEDURE QUALIFICATION RECORD		
BPQR (QMO8)		
N° B-2014-01		
DOCUMENT PREPARED BY: Paco Piquero Hernandez	DOCUMENT CHECKED BY: Paco Piquero Hernandez	DOCUMENT APPROVED BY: Gina Ferris

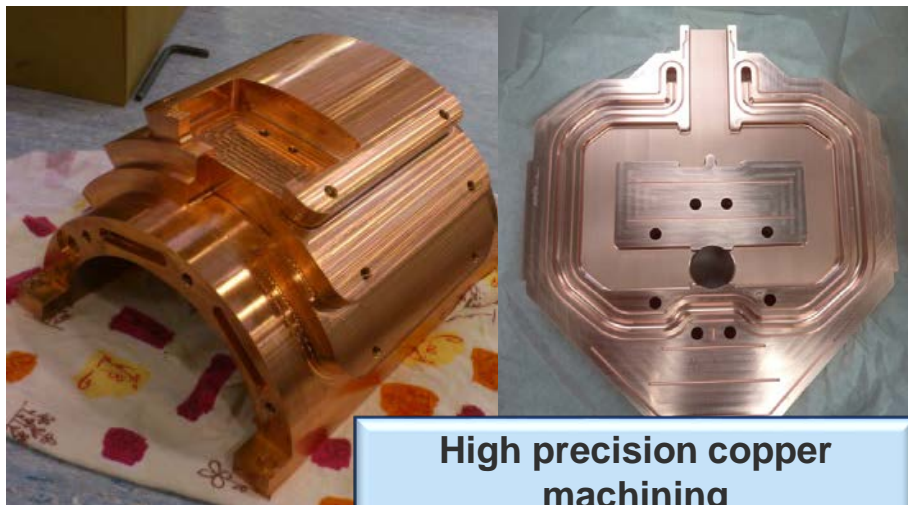
MME Subcontracting Service: recent activities Europe wide



Large trolley for HIE-ISOLDE RF cavities installation into the clean room

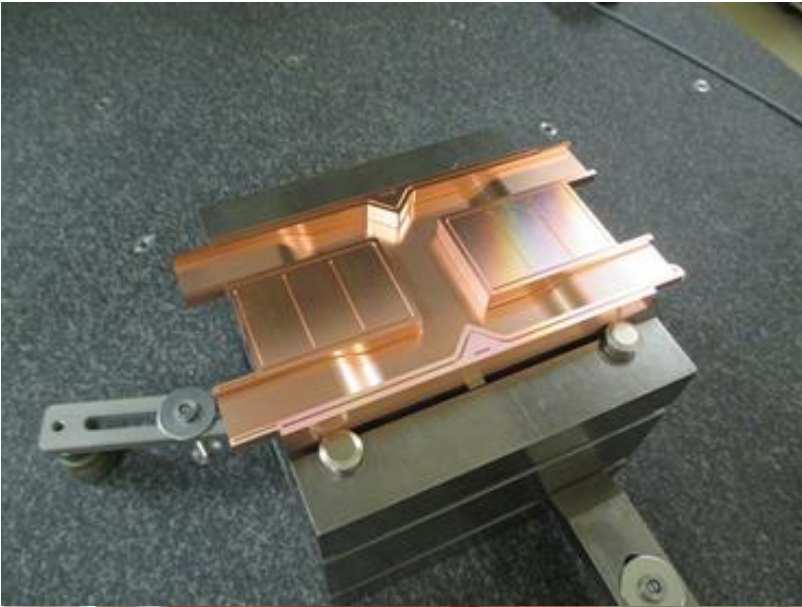


Large structure for clean room (HIE-ISOLDE project)

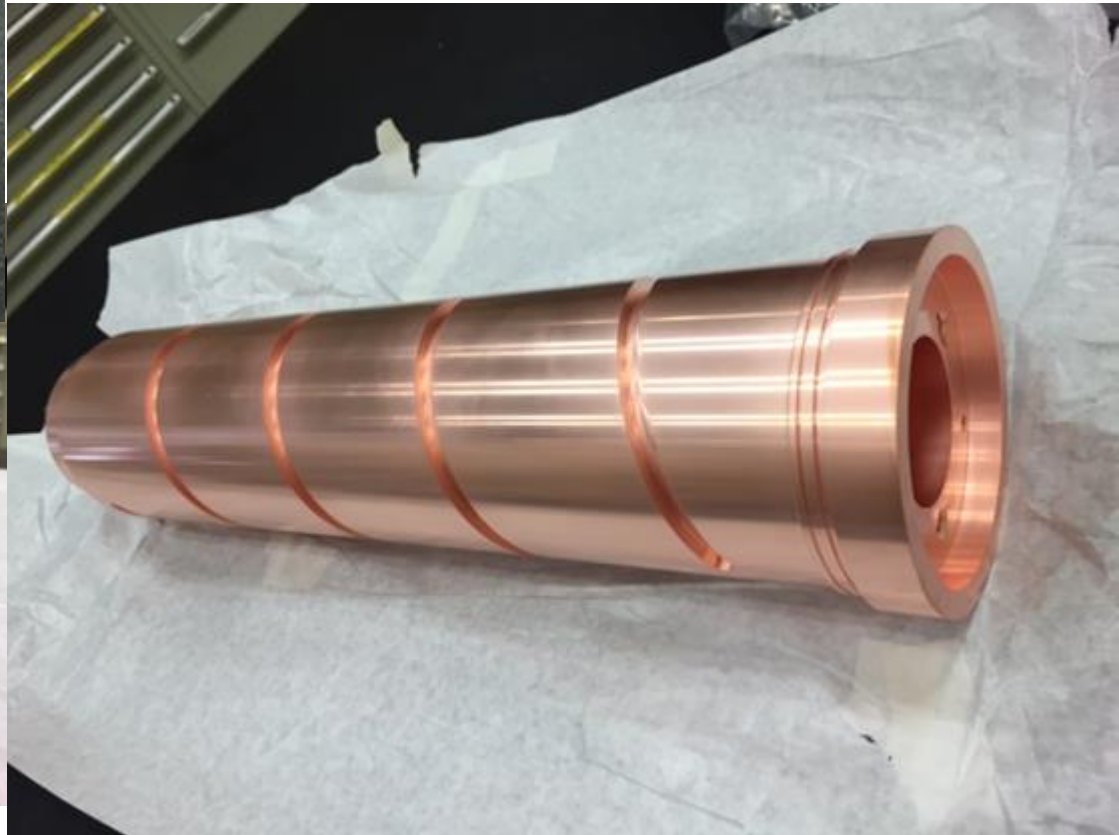
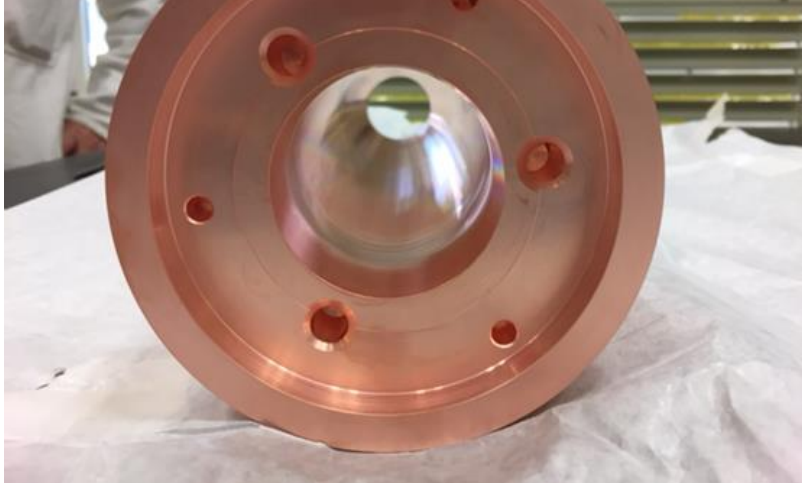


High precision copper machining

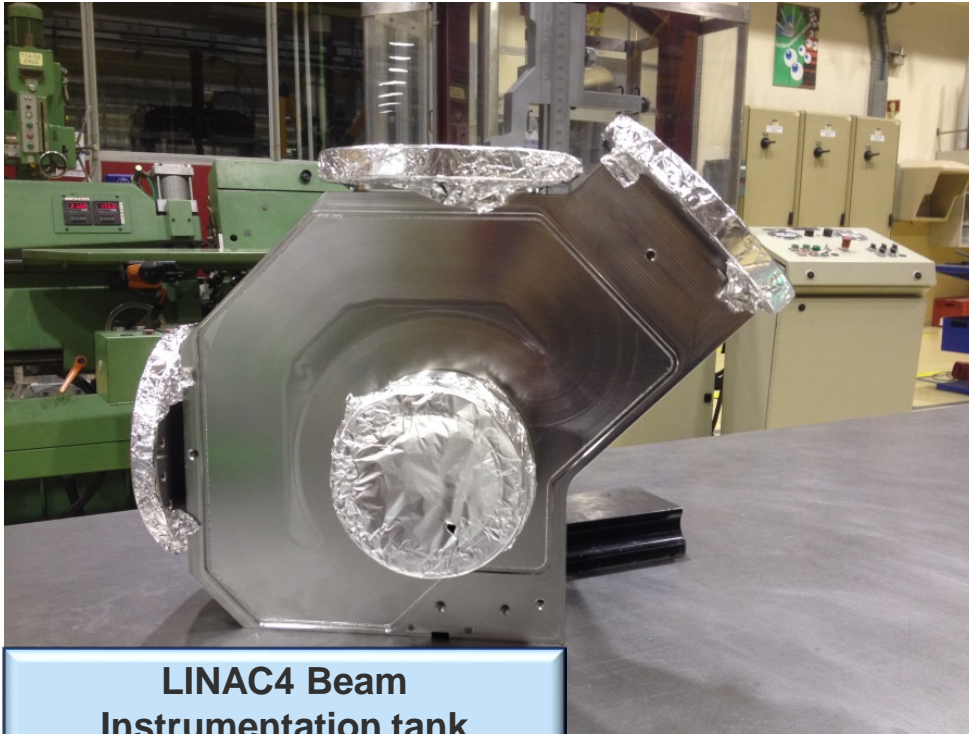
MME Subcontracting Service: recent activities Europe wide



RF Pulse Compressor on Cu
OFE 3D forged

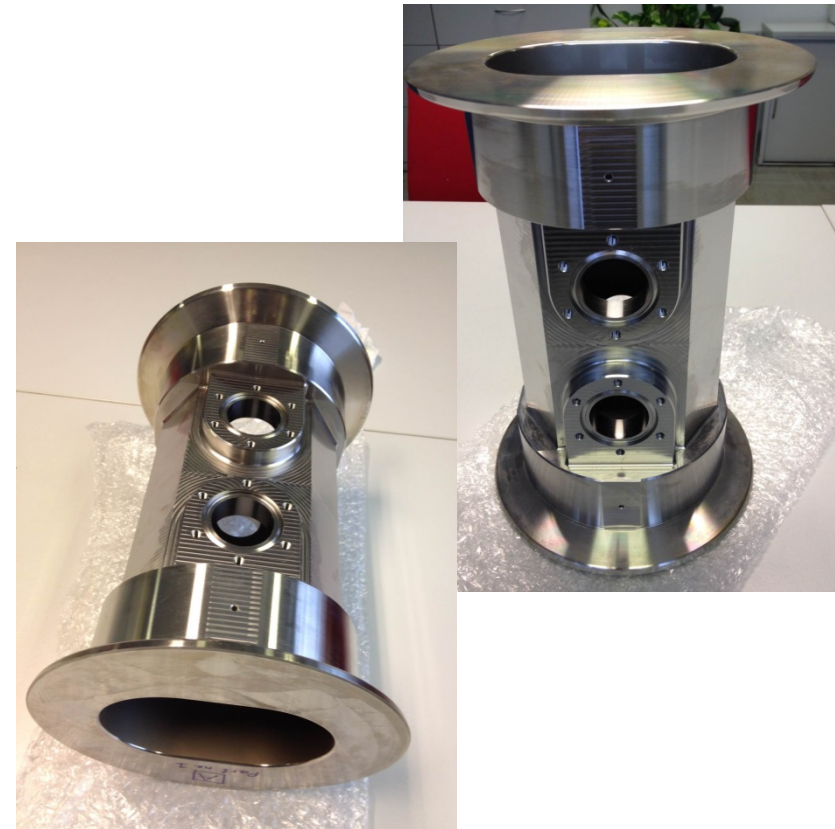


MME Subcontracting Service: recent activities Europe wide



LINAC4 Beam
Instrumentation tank

Beam Instrument
High-precision machining of
316LN



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

Machining

High precision machining on large/very large components (Steel, Stainless steel, Al, Cu Alloys, Ti, W, Mo, Nb...)

Ultra precise machining on small/medium size components (Stainless steel, Cu Alloys, Al,)

Production and machining of ceramics and plastics (small, medium, large size)

EDM (wire erosion): all technologies providing precise tolerances and complex shapes.

Various

Additive Manufacturing (especially with metals)

Thermal treatment (large components)

Surface treatments (cleaning, UHV cleaning, Ni coating, Si coating, Cu coating, anodization...)

Die forming (casting)

Pressure vessels: (construction, EU machine directive)

Lifting equipment : customized lifting equipment (calculation, detailed design, construction, CE certificate)

Welding/Brazing

TIG/MIG

Welding of stainless steel (316, 316L/LN, 304)

Welding of aluminium

Welding of Cu/Brass and Cu Alloys

Welding of Titanium

Laser welding

Electron beam welding

Explosion bonding

Soldering

Vacuum brazing

Metal Forming

Forging: particularly customized forged pieces (Stainless steel 316LN, Cu alloys, Al alloys...)

Extrusion

Casting (Iron and Aluminum)

Spin forming (Al, Cu, SS, Nb)

Punching, Fine Blanking, Deep Drawing

Thank you for your attention



ENGINEERING
DEPARTMENT