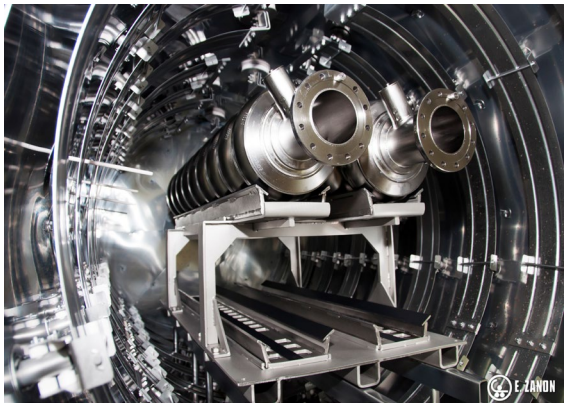
SIMAC Spa

Zanon
RESEARCH & INNOVATION

HIGH TECHNOLOGY PRODUCTS FOR RESEARCH & INDUSTRY



International Workshop on The High Energy Circular Electron Positron Collider

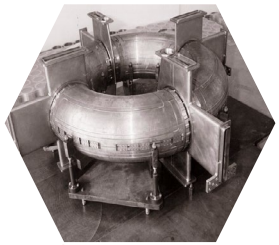
Oct. 23 - 27, 2023, Nanjing, China

HYSTORY

1919

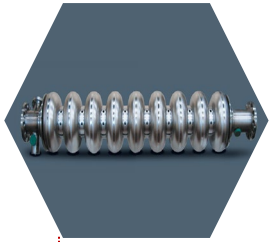
Ettore Zanon founded the company

First Industrial site in Schio, Vicenza



1970

Zanon enters in the Research field



1990

Electron Beam plant is installed. Zanon manufactures the first Niobium Cavities.

SIMIC Spa

2020

SIMIC acquires Zanon, that becomes ZANON Research & Innovation Srl.

First Pressure Equipment are manufactured

1950

Zanon manufactures the first Vacuum Vessels

1980

Zanon RESEARCH & INNOVATION

ZANON FACILITIES

The company is located in Schio, North-East of Italy,

1 hour from Venice, where the mother company SIMIC has its main workshop.

PRODUCTS & SECTORS

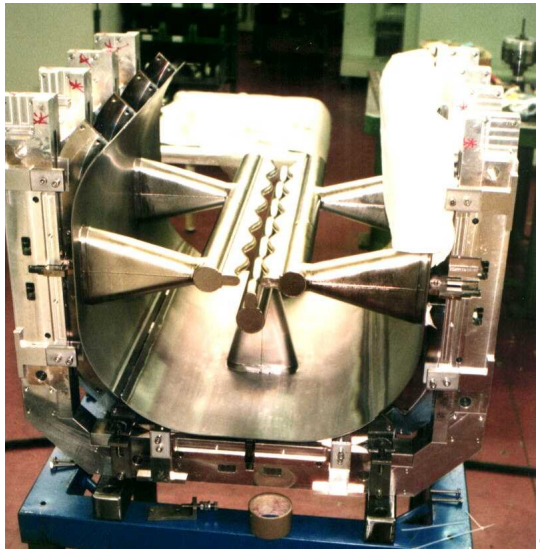
Working closely for more than 30 years with the most important Physics Research Institutes in the world, from prototyping to series production.

HIGH TECHNOLOGY PRODUCTS

- RF Cavities
- Tuners
- Cryomodules
- Vacuum Chambers
- Cryostats
- Antennas
- Collimators
- Special parts

MAIN SECTORS

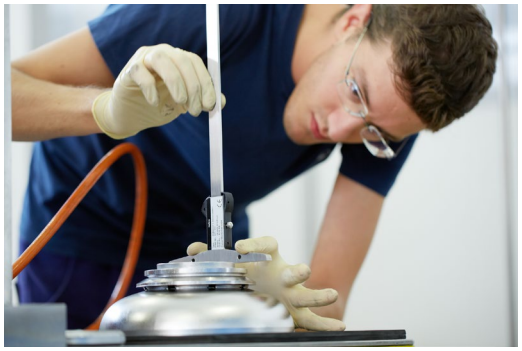
- Scientific Research
- Fusion Energy
- Aerospace
- Industry
- Medical



KNOW-HOW

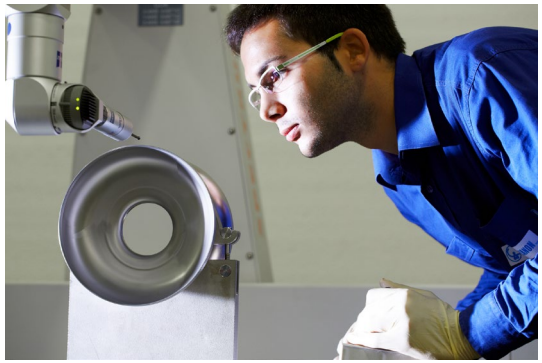
OUR MAIN SKILLS

- EB welding
- TIG welding
- Integration in Clean rooms
- Electropolishing
- UHV (Ultra High Vacuum)
- Thermal treatments
- Metrology



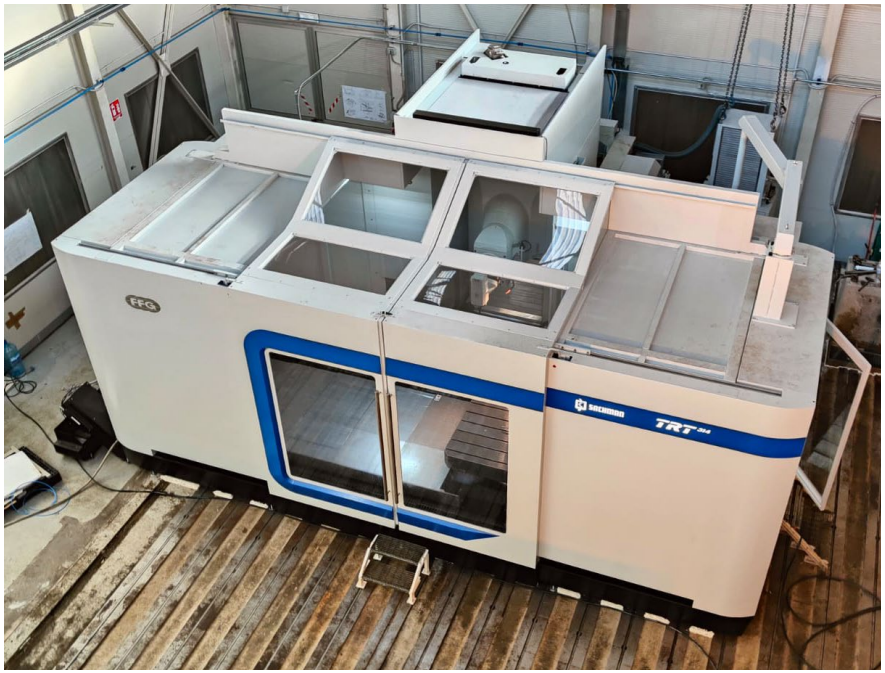
MAIN MATERIALS

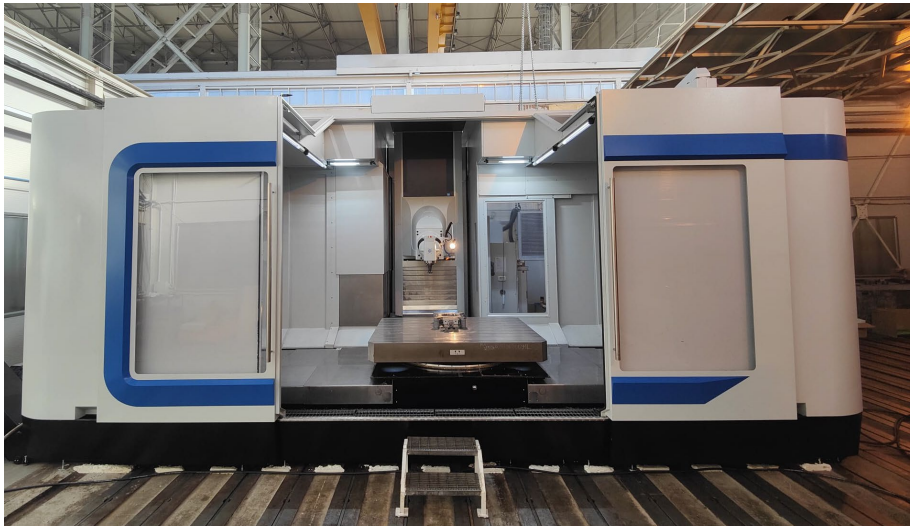
- High Alloy Steel (SS, Duplex and Superduplex)
- Niobium and Tantalum
- Nickel and Nikel Alloys (Inconel, Incoloy, Monel,
- Titanium
- Zirconium



FACILITIES & EQUIPMENT

Sachman Milling machine





5 axis CNC milling machine
1600x2000x4000 mm

FACILITIES & EQUIPMENT

SIMIC did big investments to have in house all the capability to manufacture SRF cavities from scratch:

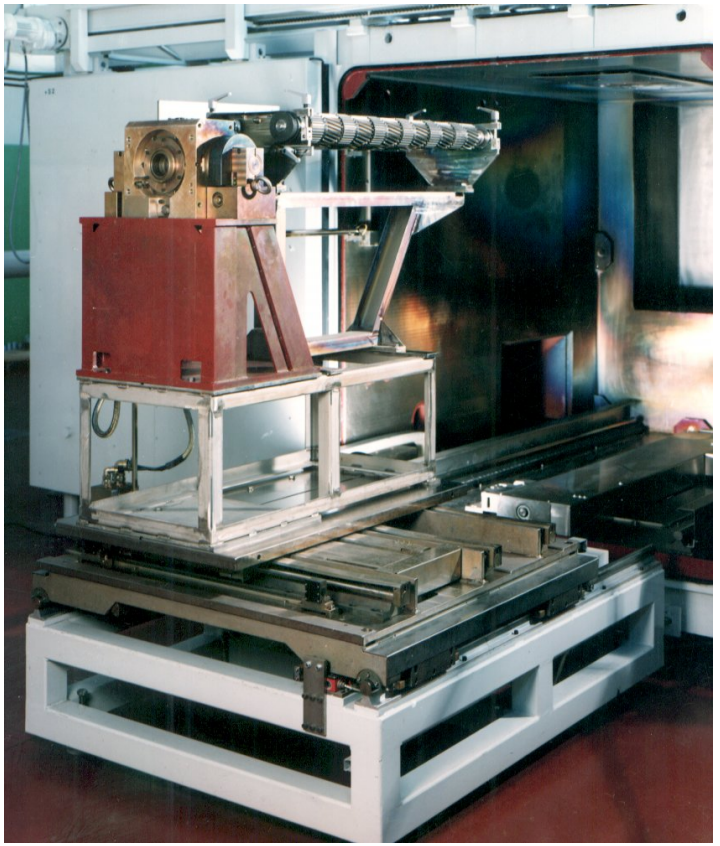
- **Nr. 2 bending machines:** minimum bending capacity on Nb Ø30 mm x 5 mm thk

FACILITIES & EQUIPMENT

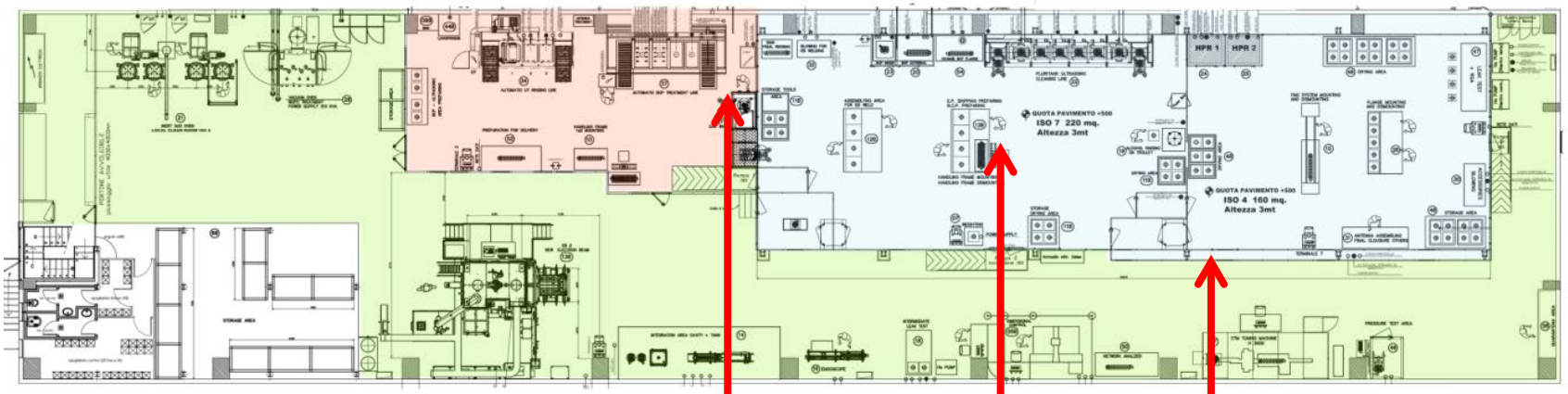
NR. 2 EB WELDING STATIONS

30 years experience in EB welding

EB welding plant: S.S. Chamber, size 3.4x2x2m, Oil-free pumping group with cryogenic pump ($3x10^{-5}$ mbar 35 minutes), nitrogen venting, RGA, 150 kV beam 30KW.



FACILITIES & EQUIPMENT



The buidling is organized
in three main areas

A) Chemical treatment area
B) Clean room ISO7/ISO4
C) Controls, Integration,
heat treatments and testing area

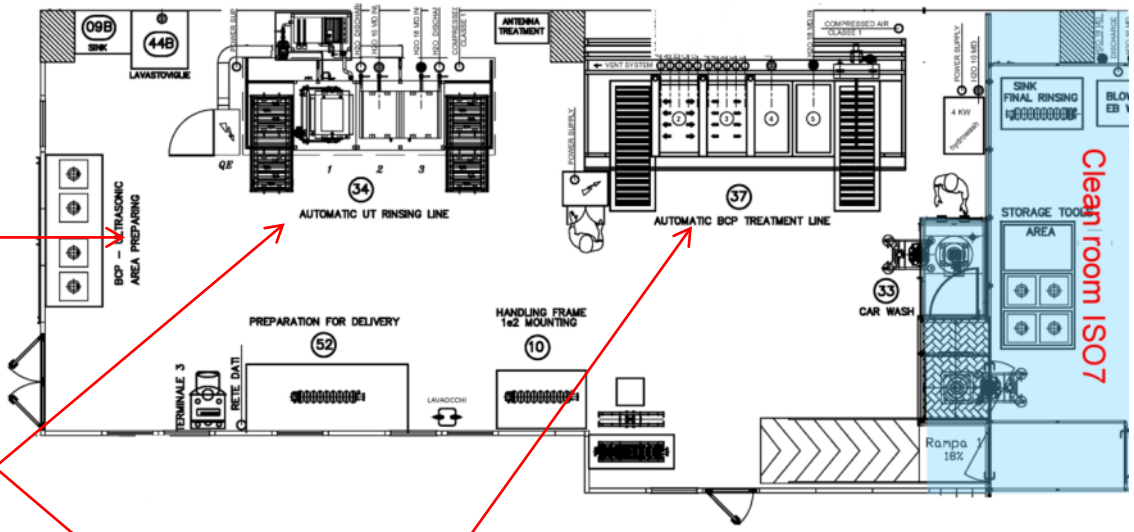
FACILITIES & EQUIPMENT

CHEMICAL TREATMENT AREA

Preparation and drying areas

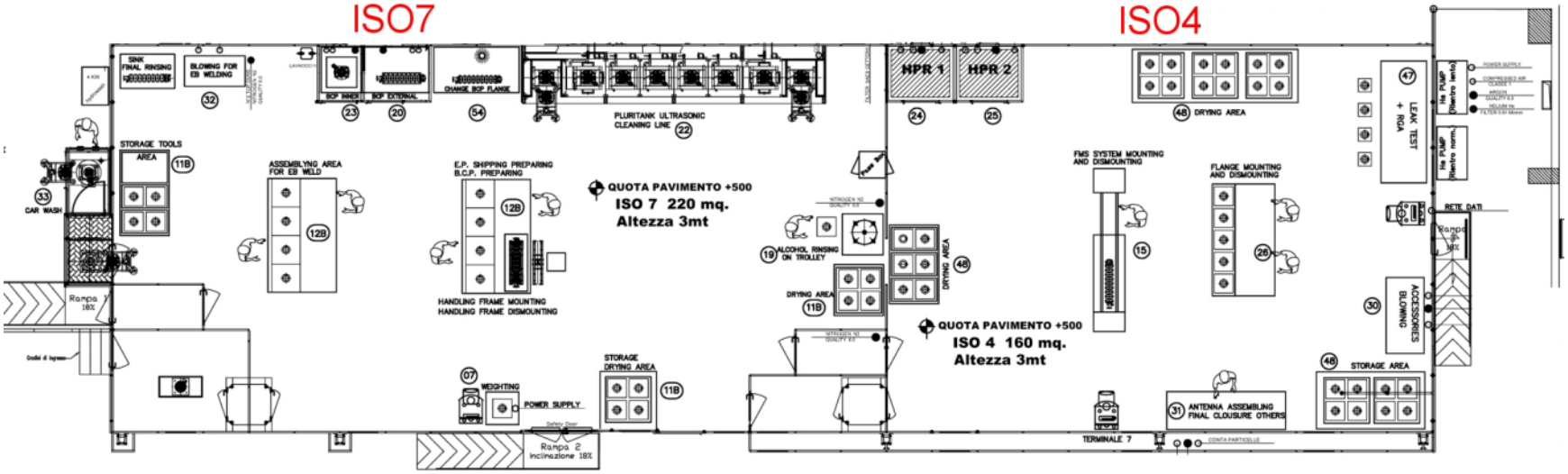
Automatic pluritank station for US cleaning , rinsing water 10 MΩcm and 18 MΩcm

Automatic BCP treatment line
2 cooled acid baths for Niobium and Nb-55-Ti
1 bath first rinsing, 1 bath final rinsing water 10 MΩcm and 18 MΩcm
protection tunnel, fumes extraction to the scrubber



FACILITIES & EQUIPMENT

CLEAN ROOM ISO7/ISO4



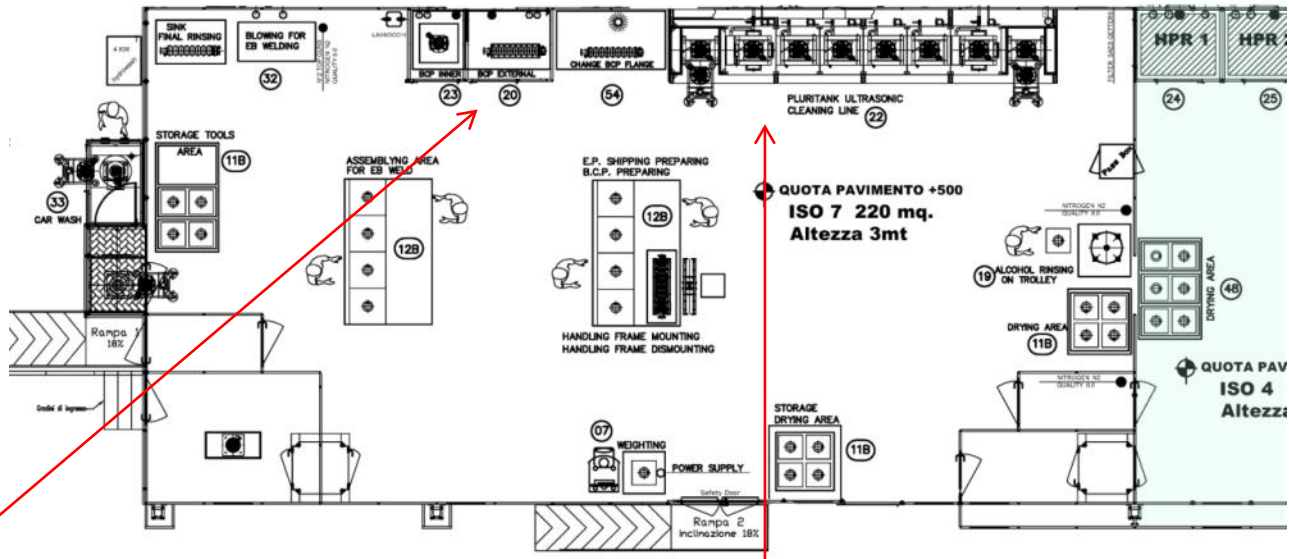
Dedicated to clean assembly, final surface treatments, final assembling for the RFcold test.
Total surface of about 450 m^2
ISO7 area 220m^2 - ISO4 area 200m^2
Operators dressing rooms, air showers
Metallic floating floor

Customized treatment stations

FACILITIES & EQUIPMENT

Clean room ISO7

Cabinets for BCP
close circuit
of the inner / outer
cavity surfaces



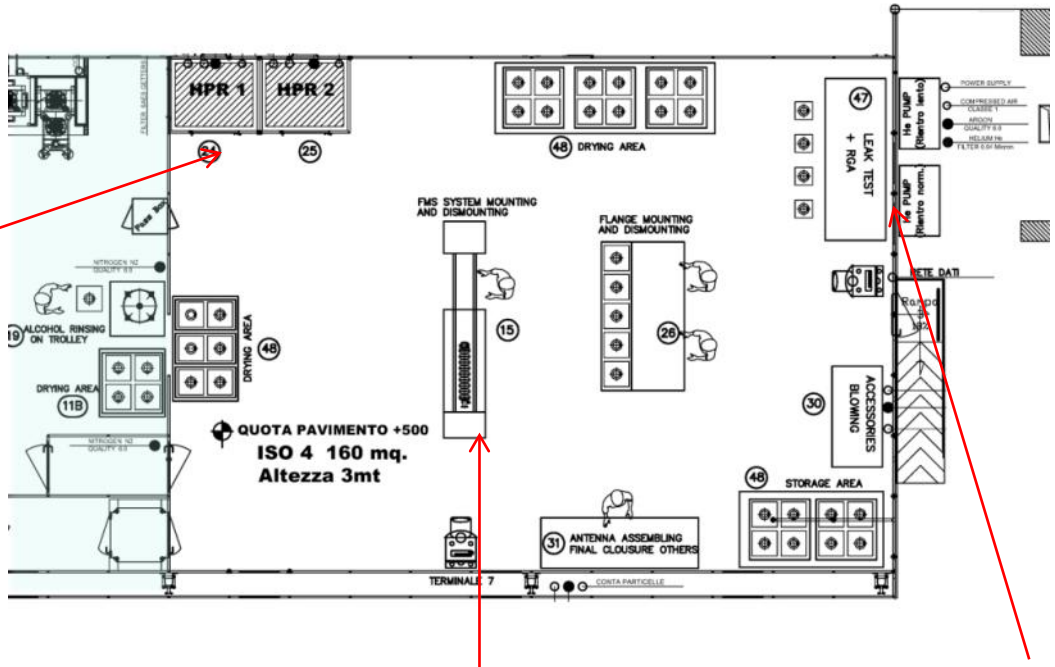
Automatic pluritank
station
for
UT cleaning and
rinsing baths
water 10 MΩcm
and 18 MΩcm

Alcol rinsing , Others

FACILITIES & EQUIPMENT

Clean room ISO 4

N° 2 cabinet for final HPR
UPW 18 MΩcm water
p>100bar , 1.5m^3/h
Cavity's rotation , vertical translation Nitrogen overlay



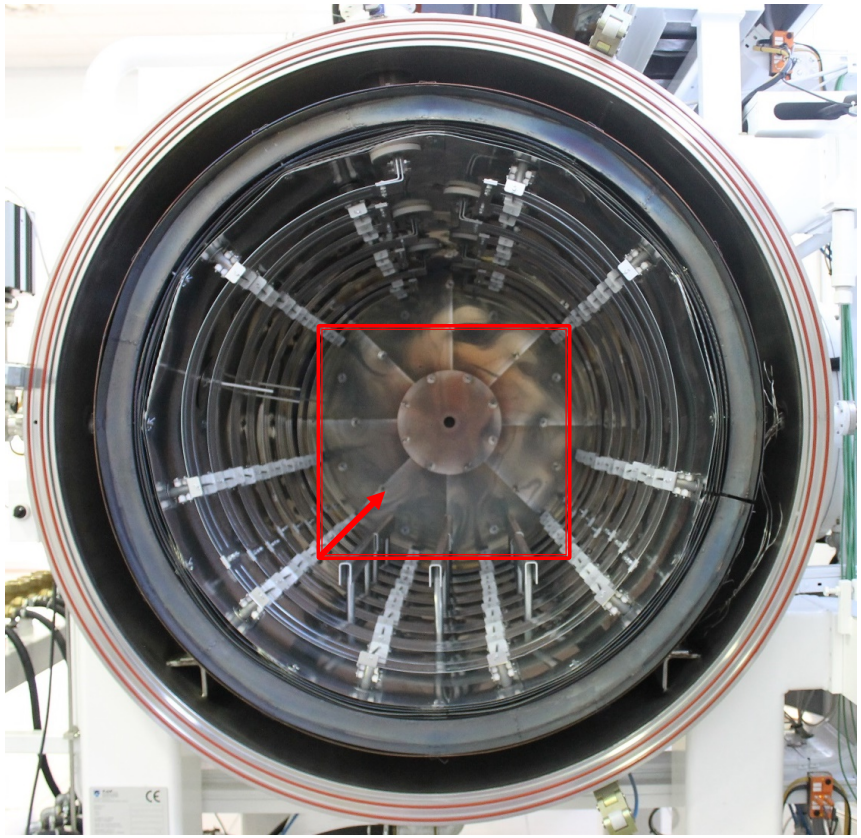
Station for final leak test special equiments for slow-controlled venting of the cavity

Assembling stations for FMS installation - RF antennas assembly

FACILITIES & EQUIPMENT

UHV oven

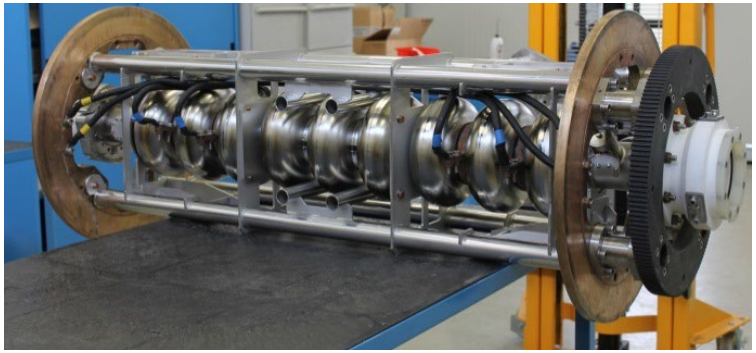
- Max working temp: 1250°C
- Temperature uniformity: ±5°C
- Temperature control: over 3 zones
- Chamber: Stainless steel
- Chamber is actively water cooled
- 1st and 2nd thermal shield layer: Molybdenum
- Heaters: Molybdenum
- Load temp control: 10 K-type tc
- Chamber temp control: 4 S-type tc (3 + overtemp safety)
- Usable working space: 600 x 600 x 1300 mm

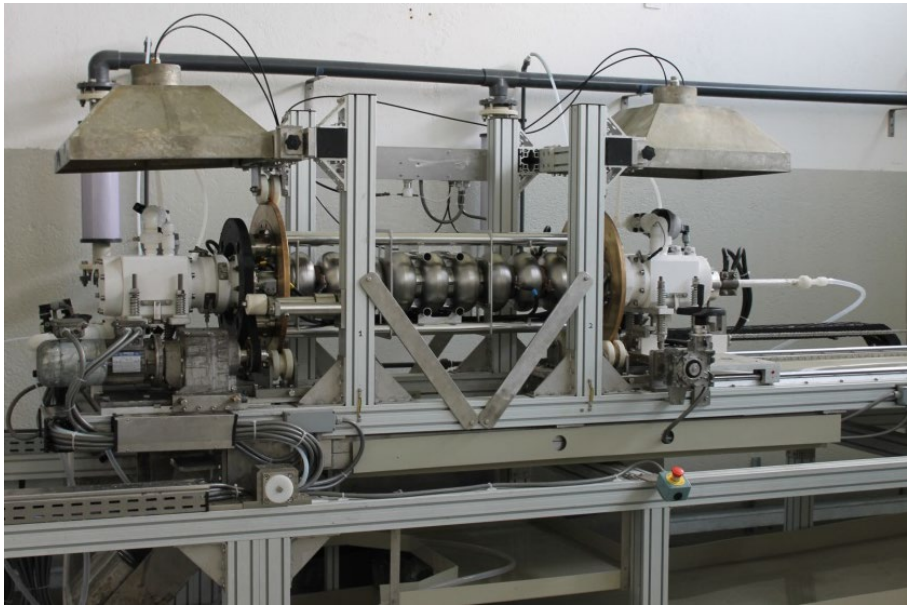


FACILITIES & EQUIPMENT

EP FACILITY

Horizontal EP, with cavity rotating
140 µm EP as first main polishing
Constant 17 V or 23 V applied on cavity
Mean current value: 270 A
Mean temperature value: 20°C

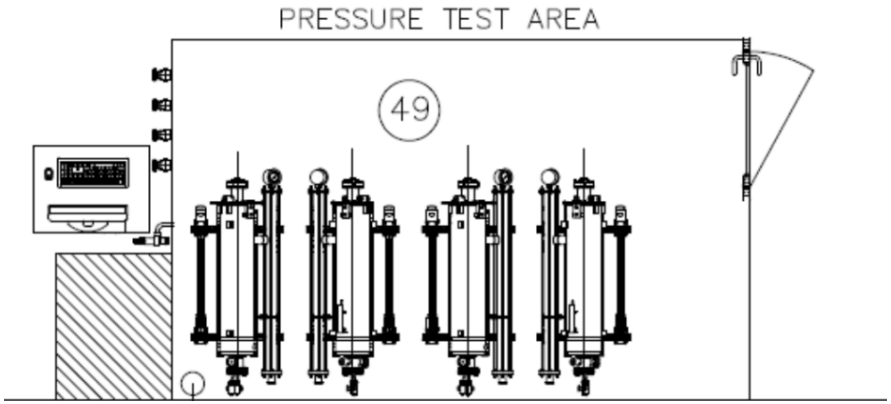




FACILITIES & EQUIPMENT

PRESSURE TEST AREA

- Realized with 10 mm thick steel walls
- Pressure monitored via webcam in real time
- Capable of testing up to four units at once
- Test pressure up to 8 bar g
- Gauges calibrated every three months



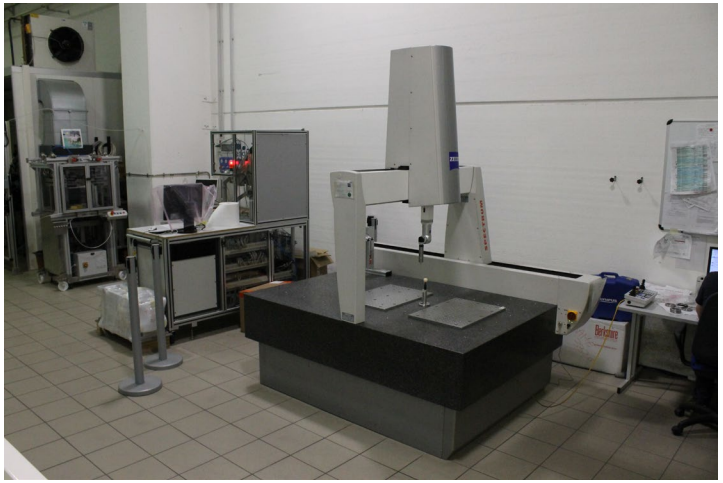
120°C BAKING STAND

EZ built in house two stands for EXFEL, adaptable to other cavities:

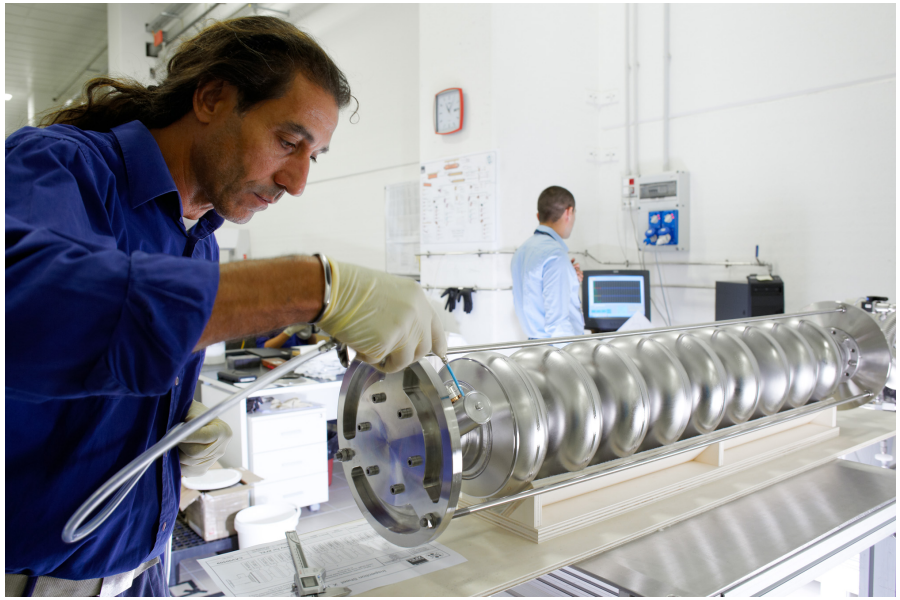
- Pumping system with LD for efficient and clean leak detection
- Pumping system supported by UPS to avoid power failures
- Connection/disconnection in ISO5 local clean room
- Operations monitored w/particle counter
- Capable of treating two cavities at once
- Heating in inert atmosphere (N_2)

FACILITIES & EQUIPMENT

3D METROLOGY



VACUUM LEAK TESTS



FACILITIES & EQUIPMENT

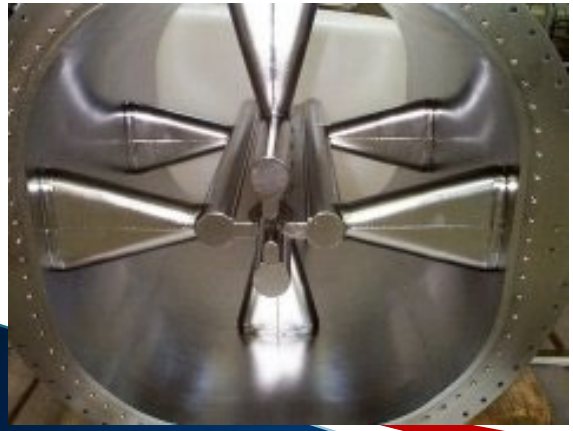
RADIOFREQUENCY TEST & FINAL TUNING

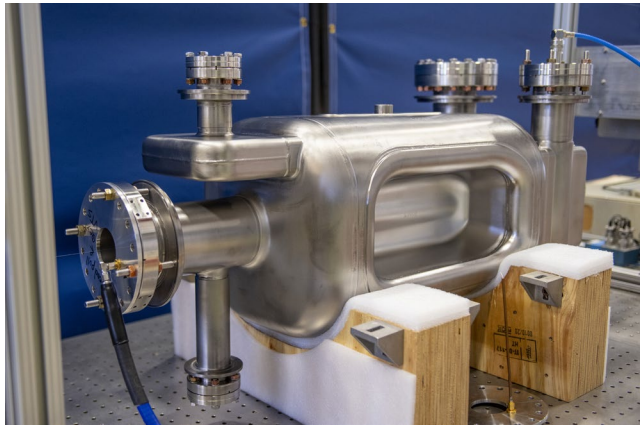
Dedicated DESY equipment for sub-component RF control and cavity final tuning

REFERENCE FOR RESEARCH INSTITUTES

SUPERCONDUCTING RF CAVITIES

- SC Quadrupole for ALPI Linac Project
- SC Quarter Wave cavity for ALPI Linac, ISAC-II, SPIRAL II, FRIB projects
- SC Half wave cavity for COSY-SCL, TRASCO, IFMIF, DONES projects
- 1 or 2 gap spokes SC cavity for Los Alamos National Lab, FNAL Proton Driver, ESS, MYRRHA projects
- SC crab cavity for HiLum project (CERN)
- SC elliptical cavities from 600 MHz to 3.9 GHz for TRASCO, EUCARD, XFEL, ESS, LCLS-II, PIP-II projects





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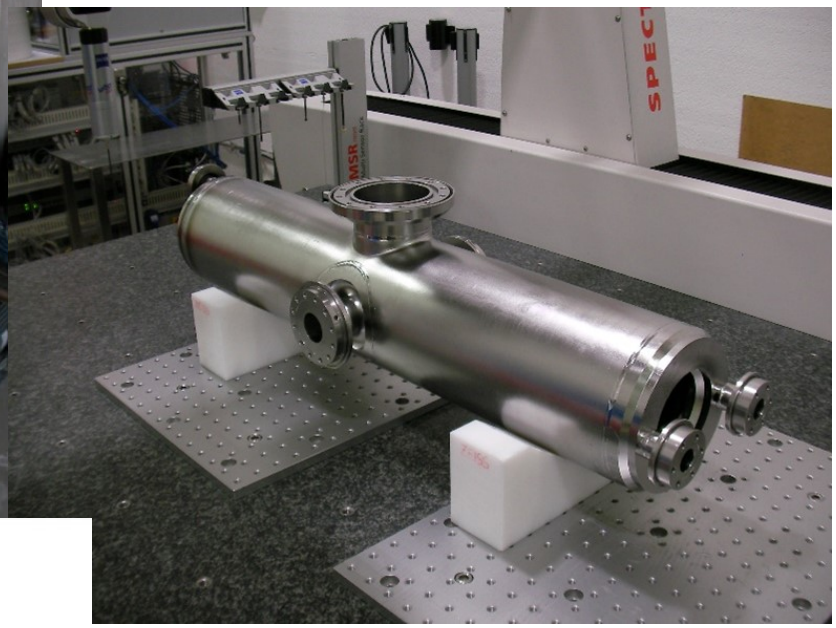
RESEARCH & INNOVATION

LOW BETA SRF CAVITIES



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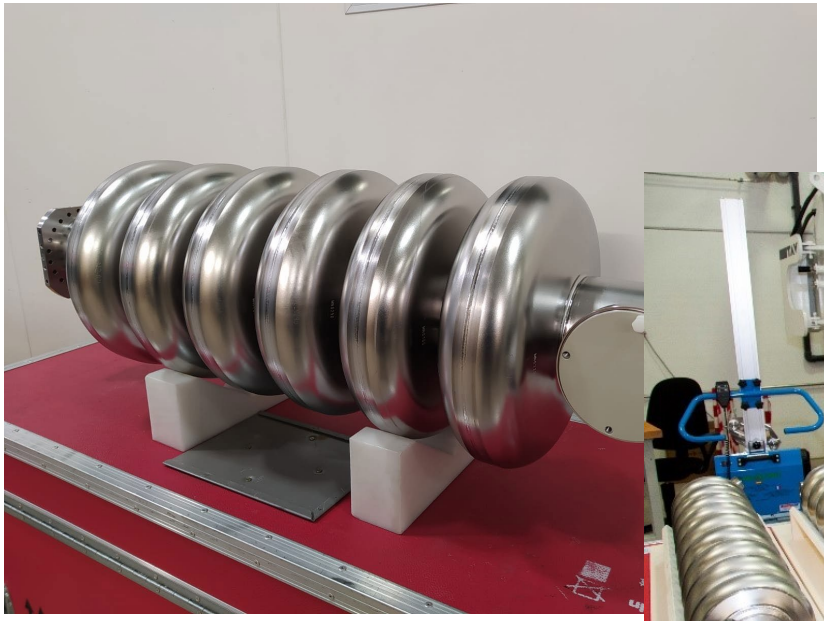
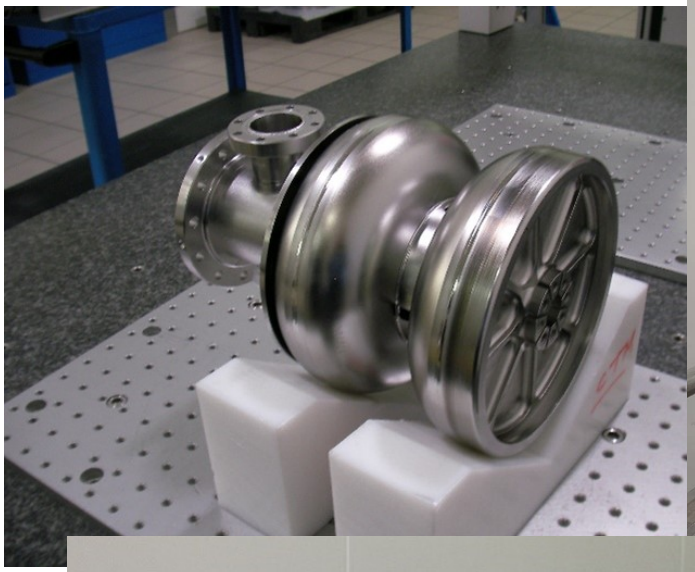
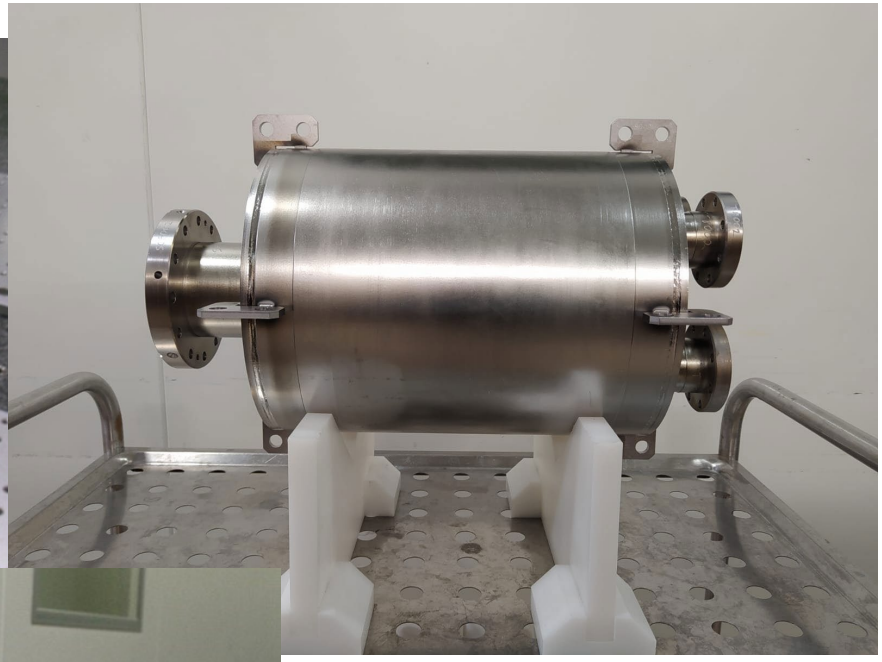
RESEARCH & INNOVATION

ELLIPTICAL SRF CAVITIES (MORE THAN 600!)



NOT ONLY ACCELERATING CAVITIES …





INVOLVEMENT IN THE X-FEL PROJECT

A) Manufacture and final treatement of **420 units** of the 9 cells , 1,3GHz SC cavities

Scope of work has included :

- Manufacture of the 1,3GHz cavities / Manufacture of their Titanium Helium tanks
- Integration of the cavities into their tank /Treatments and Surface cleaning treatments
- Components manufacture and certification according to PED (Presssure Equipment Directive)
- Delivery production rate 4 units/week

B) Manufacture and final treatement of **20 units** of the 9 cells , 3.9GHz SC cavities

Scope of work has included :

- Manufacture of the 3,9 GHz cavities / Manufacture of their Titanium Helium tanks
- Integration of the cavities into their tank /Treatments and Surface cleaning treatments
- Components manufacture and certification according to PED (Presssure Equipment Directive)

C) Manufacture and testing of **45 units** of XFEL Cryomodules

Scope of work has included

- Vacuum vessel and cold-mass prefabrication and testing
- Delivery to the assembly site (CEA-France)

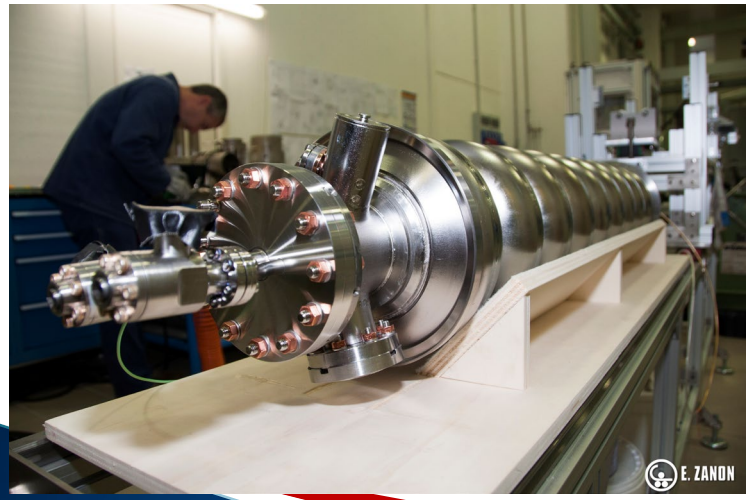
REFERENCE FOR RESEARCH INSTITUTES

INVOLVEMENT IN SHINE (Shanghai high-repetition-rate XFEL and extreme light facility) PROJECT

- Manufacture and final treatement of **8 preseries and 60 series** of the 9 cells, 1.3GHz SC cavities

INVOLVEMENT IN DALS (Dalian Advanced Light Source) PROJECT

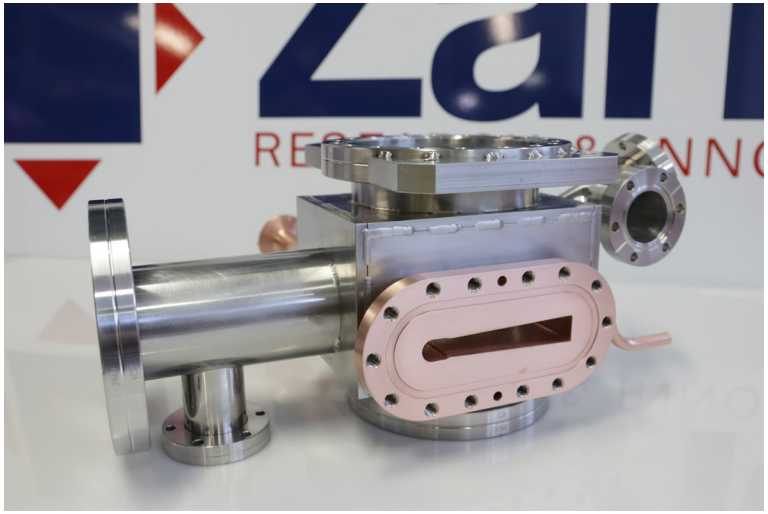
- Manufacture and final treatement of **12 preseries** of the 9 cells, 1.3GHz SC cavities

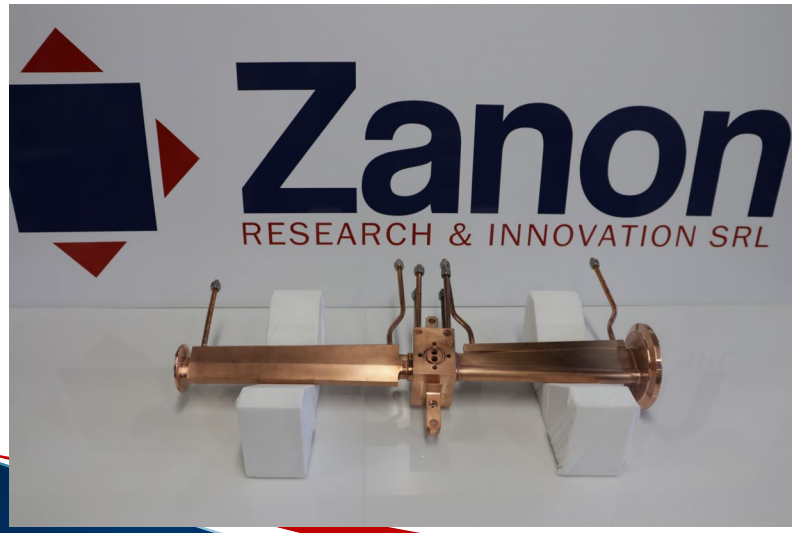


REFERENCE FOR RESEARCH INSTITUTES

UHV CHAMBER FOR SYNCHROTRON

Mechanical construction of 2 different types of UHV chamber for ALS-U development at LBNL made in copper C10100-C18150 and SS316LN

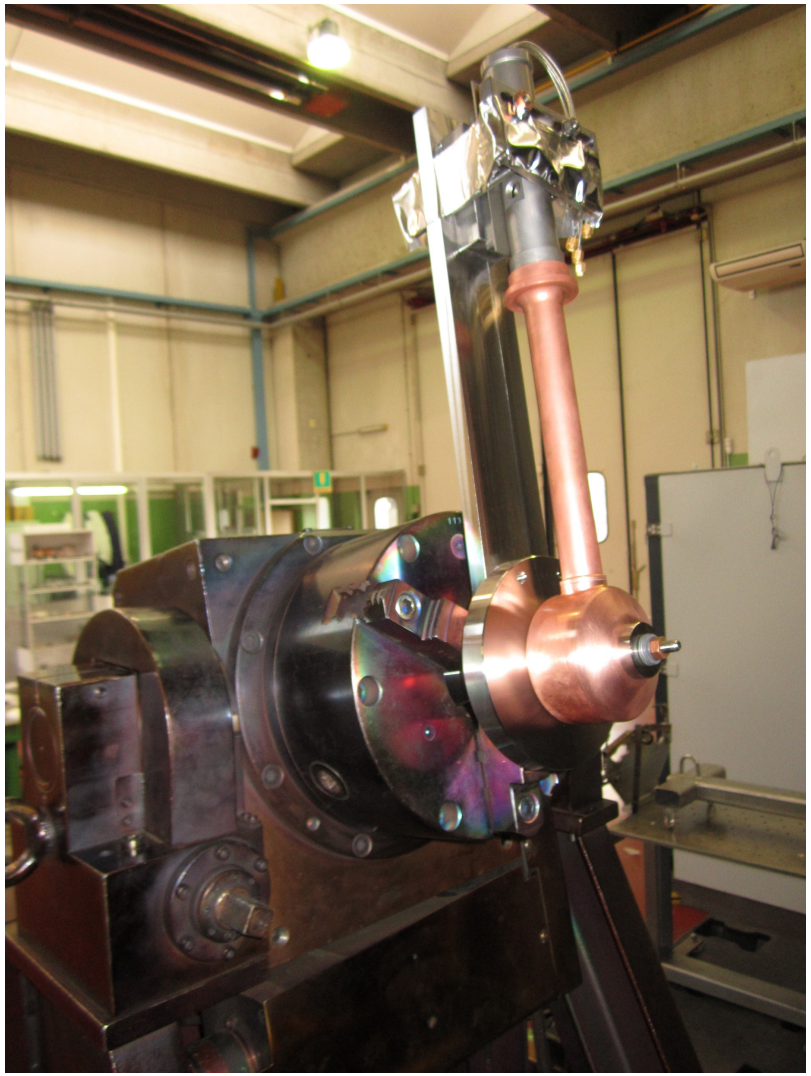




REFERENCE FOR RESEARCH INSTITUTES

DRIFT TUBES FOR ESS PROJECT

EB welding of the drift tube for ESS project



REFERENCE FOR RESEARCH INSTITUTES

CRYOSTATS & CRYOMODULES

Zanon working with Research Institutes from early ’80.

- R&D phase and Production of 45 cryomodules for TESLA Test Facility and XFEL Project at DESY-Hamburg

REFERENCE FOR FUSION ENERGY

VACUUM VESSEL FOR SPIDER PROJECT, NBTF, RFX PADUA

Zanon participated with an international consortium to produce the Ion Source prototype for ITER beam injectors.

Zanon's scope comprised:

- Vacuum vessel
- Beam source support frame
- Beam source electrostatic shields
- Beam source handling tool

Material AISI 304 L
Ø 4300 mm
L 6500 mm
Ports ~ 140
Vacuum level 10-7 mbar

WHO IS SIMIC

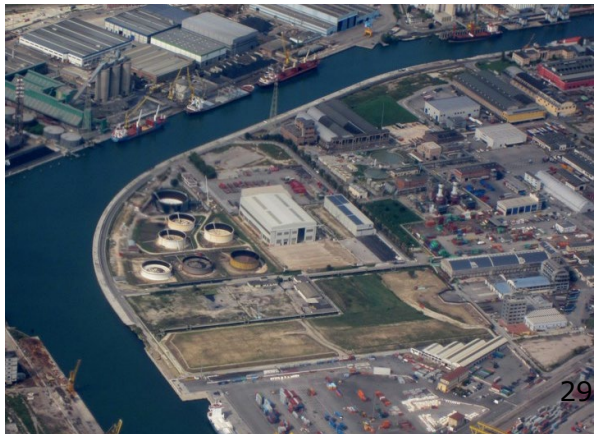
- ✓ **Main Activities**:
  - Manufacturing of large & complex mechanical components, vacuum & pressure equipment.
  - Site erection and maintenance of plants

- ✓ **Main sectors**:
  - Physics Research, Nuclear Fusion, Oil&Gas, Petrochemical, Fertilizers, Power, Pharmaceutical, Food, Industry

- ✓ **Figures**:
  - 180 M€ revenue / 800 employees

- ✓ **Present in 9 countries:**
  - Italy, France, Germany, Romania, Belgium, Mexico, Brazil, Turkey, Canada, USA

- ✓ **2 industrial sites in Italy:**
  - Camerana Site, Headquarters & workshop 85.000 sqm (capacity 100 tons)
  - Porto Marghera, Venice**,** High-capacity workshop (2000 tons)



SIMIC MAIN SKILLS

- High precision machining
- High technology welding
- Narrow Gap TIG Welding, Manual & Robotized
- Final assembly & integration
- NDE
- Vacuum Technology
- 3D metrology
- Site erection and maintenance

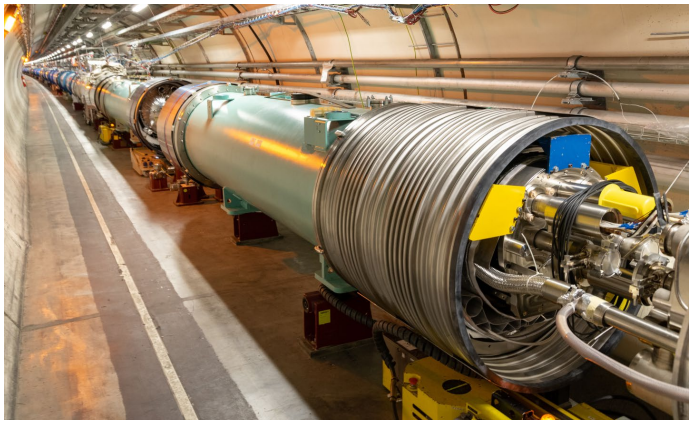
SIMIC PRODUCTS

MAIN PRODUCTS

- High-tech prototypes & series production
- Complex Mechanical Components
- Cryostats, Vacuum Vessels
- Cryomodules
- Cold Boxes complete of instruments and multilayer insulation
- Reactors & Pressure Vessels
- Complex tooling
- Site assembly and maintenance

MAIN MATERIALS

- Stainless Steels
- Copper & Alloys
- Aluminium & Alloys
- Nichel Alloys
- Titanium
- Carbon Steels
- Low Alloys
- Others



SIMIC FACILITIES

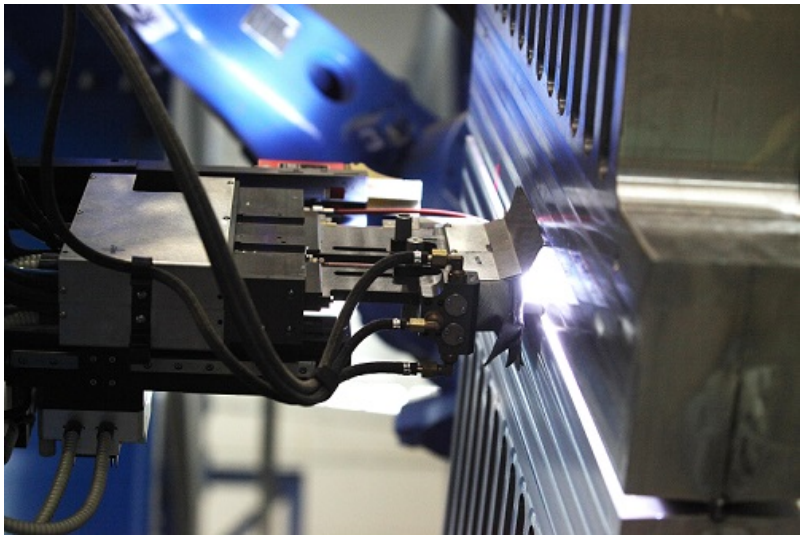
MAIN MACHINING EQUIPMENT

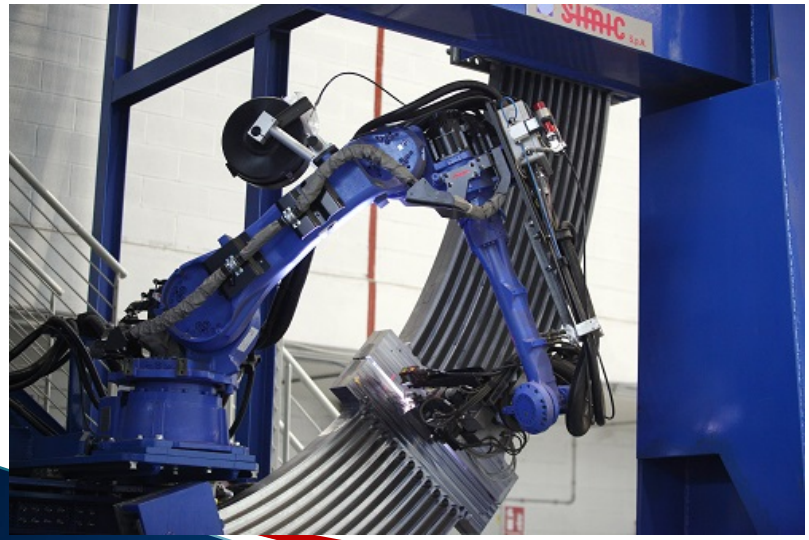
Simic is fully equipped with the most advanced machining systems

- **PAMA milling & boring machine VERTIRAM**
  (X 15.000 mm * Z 2.500 mm
  Y 4.000 mm). Power 60 KW.

- **PAMA PORTAL milling machine SPEEDRAM**
  (X 18.000 mm * Z 5.500 mm * Y 10.100 mm). Power 100 KW. Temperature controlled environment **(20±1°C)**

SIMIC FACILITIES





MAIN WELDING EQUIPMENT

Simic is fully equipped with the most advanced welding systems

Weldable thickness up to 300 mm

- MIG-MAG semi-automatic and manual welding
- TIG welding
- TIG orbital welding
- High thickness Narrow Gap TIG welding by robot
- Submerged Arc Welding
- Cladding by Electro-slag weld overlay
- Others

SIMIC FACILITIES

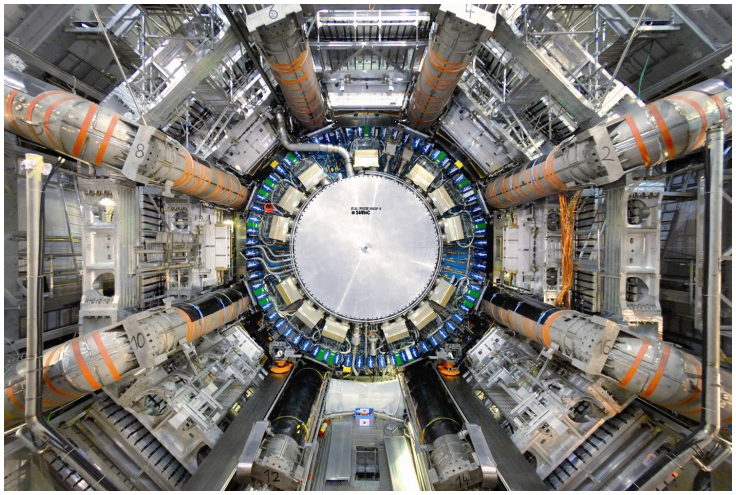
3D MEASURING by LASER, ARMS, PHOTOGRAMMETRY

LEAK & PRESSURE TEST; NDE

CLEAN AREAS
For assembly and final testing

SIMIC REFERENCES

SIMIC is working with CERN & many other Research Institutes for more than 20 years. SIMIC is among the main contributors of LCH Project, at CERN.



ENDCAP CRYOSTAT FOR ATLAS

Material: Alluminium AL 5083
Diam: 5.500 mm
Thk: 160 mm
Weight: 40.000 kg

Cryogenic Tests at 90K
Super Insulation Leak Test <1X10-8 mbar. l/s

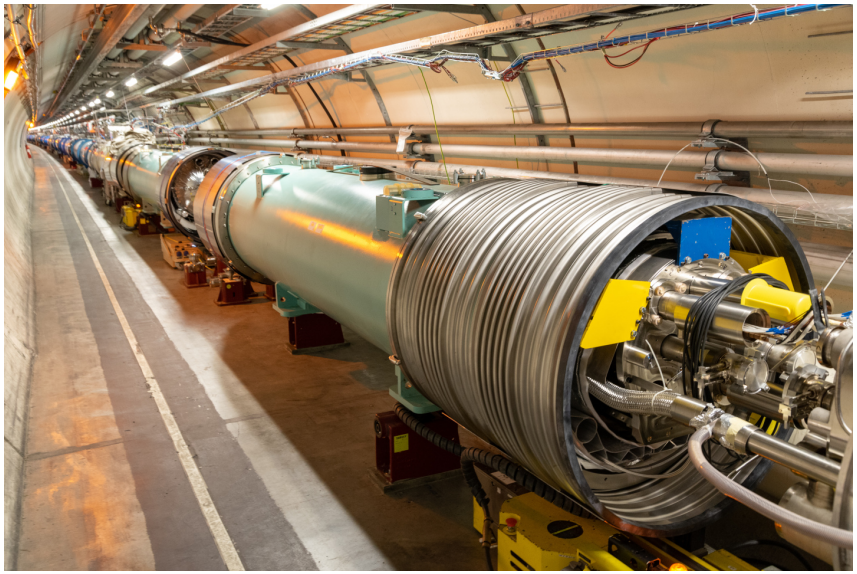
250 CRYOMODULES FOR LHC

Material: AISI 304 L, Aluminium, Cu-Ni
Weigth: 2000 Kg
Length: 6.650 mm

Pressure test up to 25 bar;
He Leak test < 1x10-8 mbar.l/s

3D Dimensional inspection,
Instrumentation test

SIMIC REFERENCES



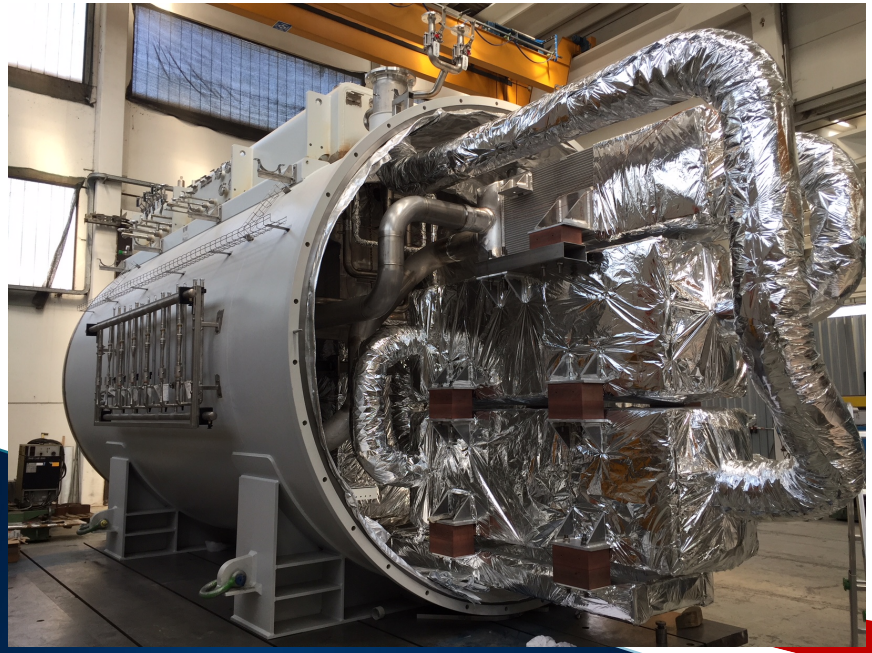
N. 937 VACUUM VESSELS

LHC PROJECT – CERN

MATERIAL : AISI 3016 L

TESTS: He LEAK TEST <1x10 -8 mbar. l/s

3D measurement



COMPLETE COLD BOXES WITH INTEGRATION (ESS PROJECT)

Cold Box complete of vacuum vessel, instrumentation, piping, superinsualtion. Manufacturing and integration.

He Leak test < 1x10-8 mbar.l/s

SIMIC REFERENCES

SIMIC is among the Leaders in the Fusion Energy sector and is among the main contributors to ITER project. **Working in Fusion Energy for more than 15 years**.

ITER PROTOTYPES & SERIES PRODUCIONS

- VACUUM VESSEL PROTOTYPE
- DIVERTOR PROTOTYPES and SERIES
- MAGNETS SYSTEM (70 Radial Plates and 10 TF Coils – very large and complex projects)

Weight of TF COIL - 320 tons/ each

OUR MISSION

OUR MISSION AND STRATEGY

- **SYNERGY**

Create Synergies between SIMIC and ZANON on know-how, expertize, facilities and equipment.

- **CREATION OF VALUE**

Create value by investing in the growth of our resources, know-how, facilities and equipment.

- **DIVERSIFICATION**

Offer our customers a wide range of High-Techology products for different fields.

Thank you for your attention

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