antec

ANTEC MAGNETS, S.L.U.

PROJECTS & EXPERTISE

ANTEC MAGNETS, S.L.U.

COMPANY:

ANTEC Magnets, S.L.U.

OFFICES:

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https://antec-group.com/en/magnets/

WORK-FORCE:

- 6 persons

FACILITIES:

• Workshop area	600 m^2
• Offices area	50 m^2
• Stores area	75 m^2
• Clean area	250 m^2
• Other	25 m^2

Total area	1.000 m^2

PRODUCTS Magnetic systems

- Multi-pole magnets, coils and yokes
- Accelerator magnets
- High-precision magnetic devices
- Superconducting solenoids
- Superconducting coils and magnets
- Permanent magnets applications

PRODUCTS

Windings - Conductor

MATERIAL
- Copper, aluminium...
- Superconductors (low and high temperature)

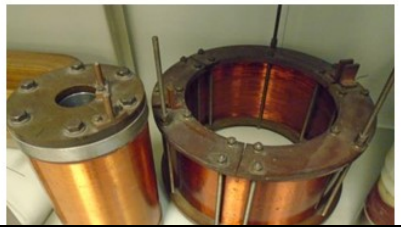
DIMENSIONS
- Round conductor (Ø 0,5 mm to Ø 10 mm)
- Rectangular (2 x 1 mm^2 to 15 x 15 mm^2)
- Hollow conductor (4 x 2 mm^2 to 15 x 15 mm^2). Hole Ø 2 to Ø 10
- Strips (up to 150 x 2 mm^2)

INSULATION
- Enamel, fiberglass, mica, Kapton ... Depending on parameters like insulation voltage or radiation hardness.

Windings - Shapes

Double pancake

Cos Φ

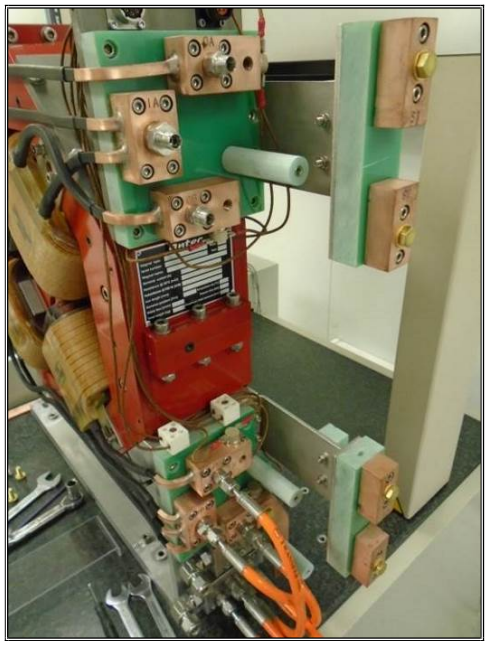


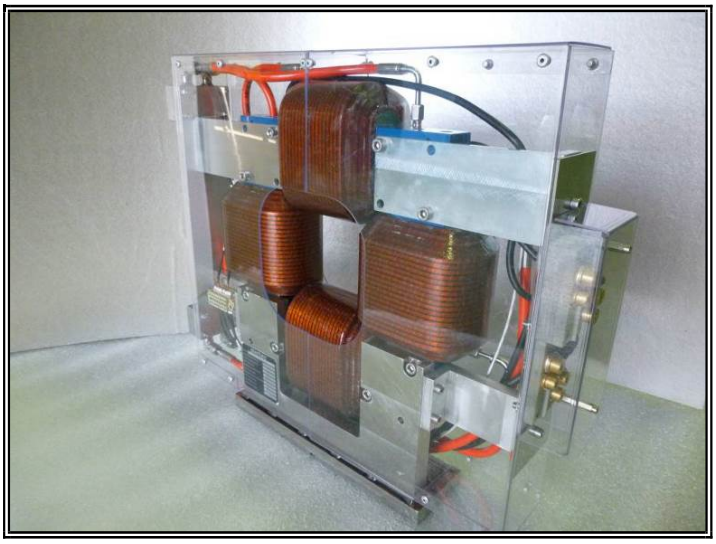
PROJECTS

ANTEC Magnets has built high-technology products (steel cores with high magnetic permeability, correcting magnets, focusing magnets, special coils, etc.) for different customers in Europe. These have been manufactured mainly for CERN, though, has also been supplied to other European research laboratories such as COSY in Julich, Germany, Commissariat à l'Energie Atomique (CEA) in Saclay, ESRF (Grenoble), PSI (Switzerland), CNAO (Italy), XFEL (Germany) among other.

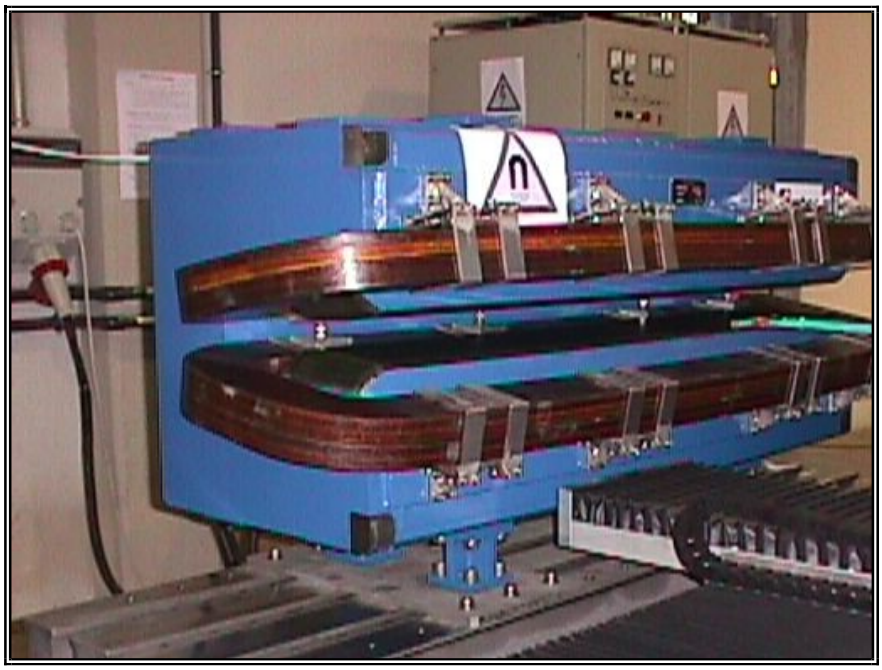
A brief list of the manufactured products and their main characteristics is presented:

WARM MAGNETS



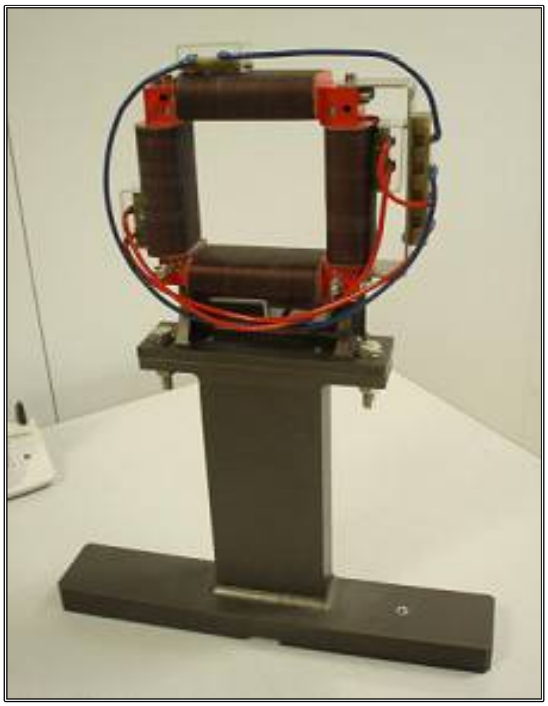


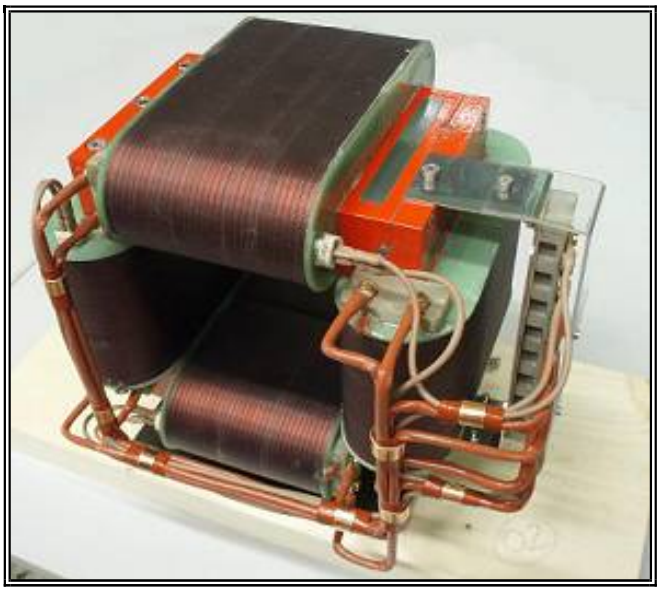
Warm Corrector HIE Isolde CERN



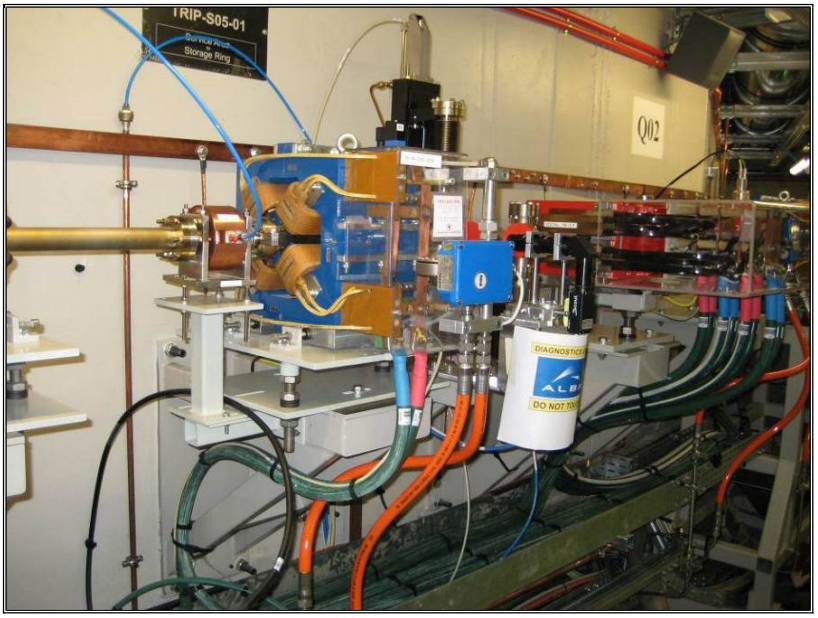
Magnetic tests of Prototype Combined Dipole ALBA Synchrotron (Barcelona)

Dipole for Spectrometer at UAM (Madrid)

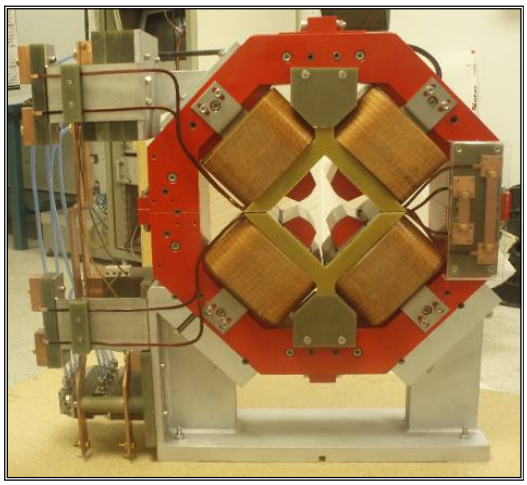




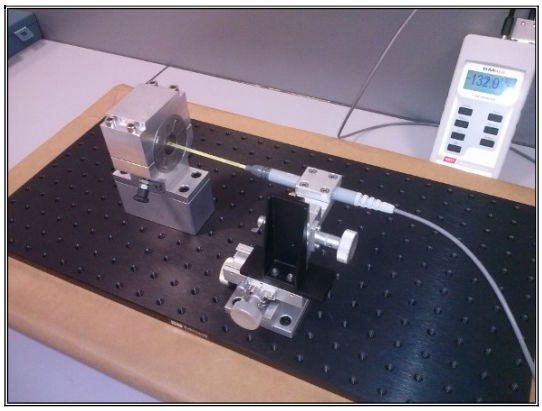
Warm Double Dipole Corrector Magnet LINAC4 and REX ISOLDE Projects (CERN)



Booster Quadrupoles installed at ALBA (Barcelona)

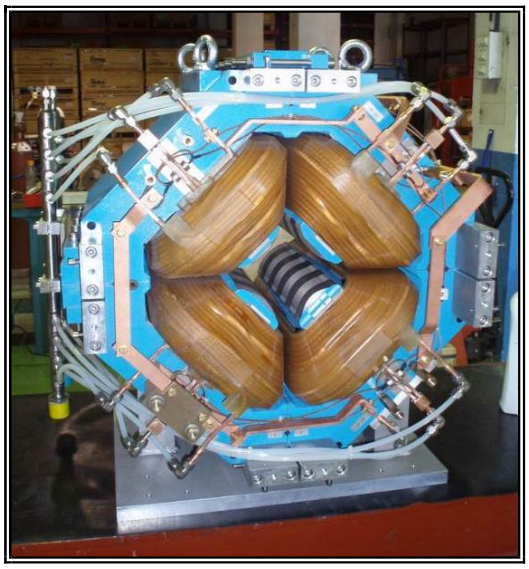


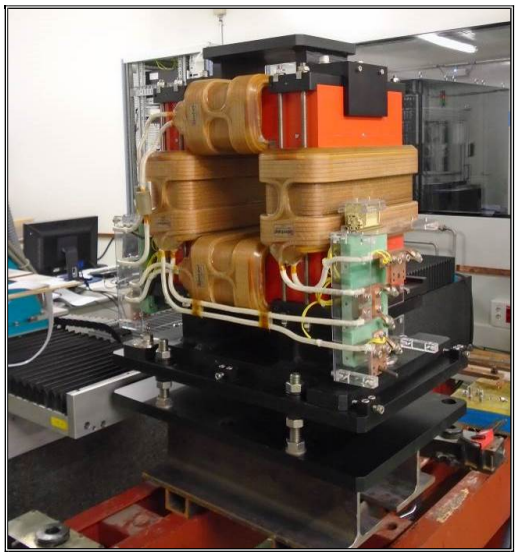
Warm Quadrupole ESRF Upgrade and MEBT Warm combined Quadrupole (IFMIF)



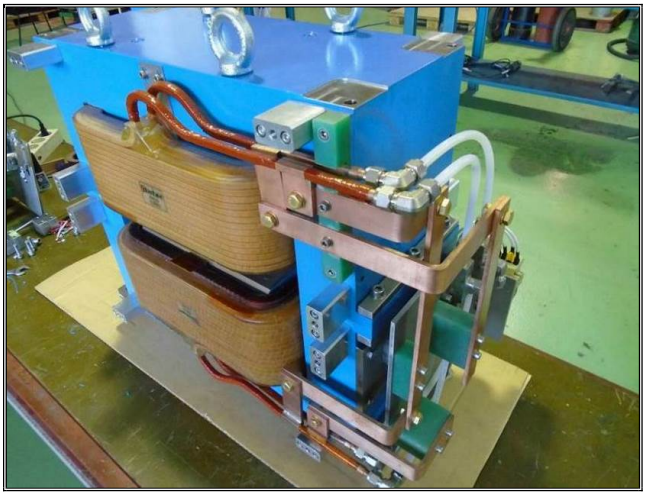
Permanent Quadrupole radiation resistance test ESS Bilbao (SmCo)

Nano Particles magnetic Separator (In size) NdFeB

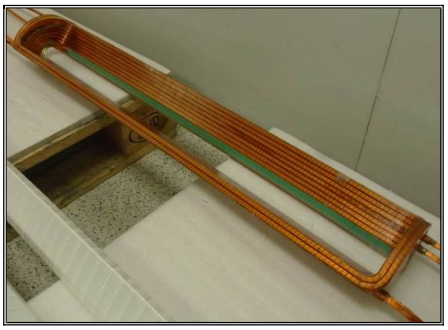




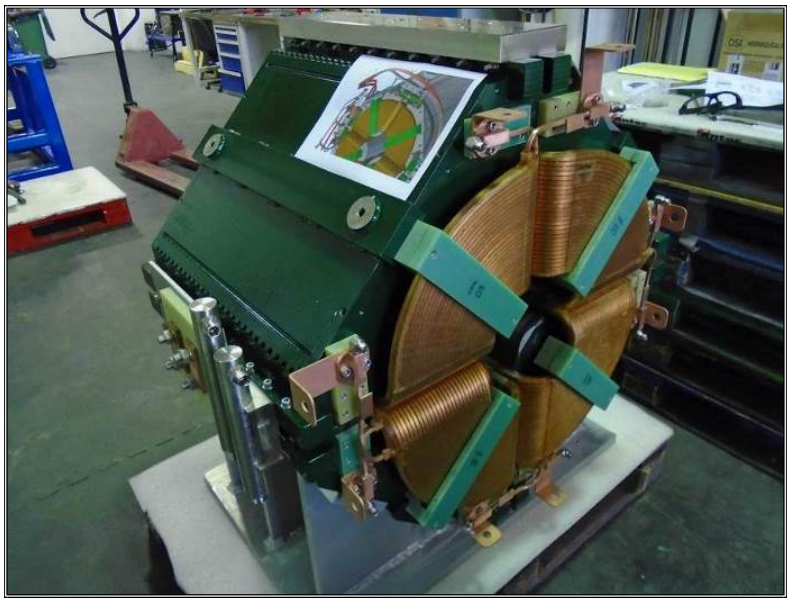
Warm Quadrupole PSI and Warm Corrector CNAO



Dipole CLARA Project at STFC Daresbury (UK)



VPI coils



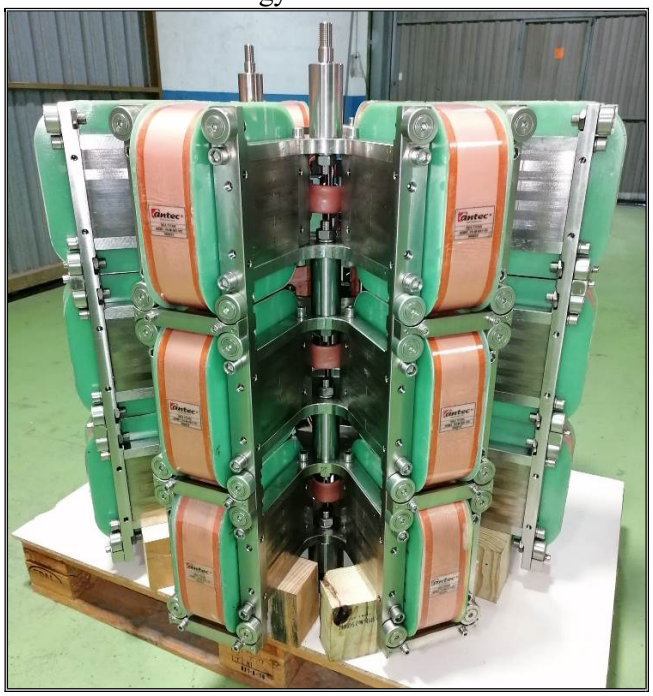
PSB Transfer Line Quadrupole Magnets for the LIU Project – CERN

Quadrupole Magnet for the Antiproton Decelerator (AD) Target Area – CERN

- Design and manufacture of a new concept of a wet basis magnetic separator. The magnetic separation is performed by means of a magnetized up to 15.000 gauss iron matrix.
  This new product commercialization is intended to begin shortly.

Wet Basis Magnetic Separator

- For the wave energy sector ANTEC Magnets has built part of the Direct Drive Power Take-Off (PTO) solution to be used with a wave energy converter in the frame of the Sea Titan Project.



Active module for the Sea Titan machine

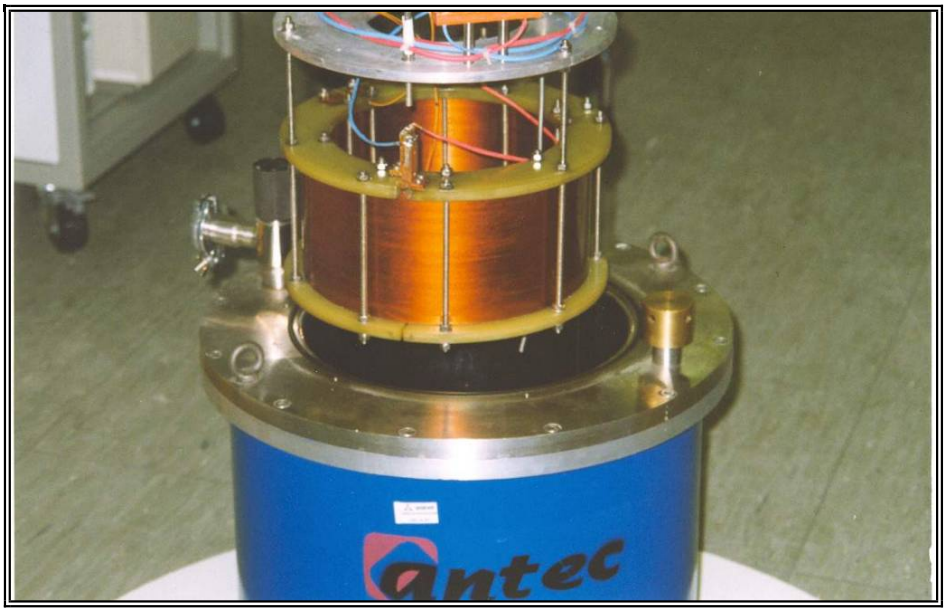
- Other Projects as magnetic systems for particle orientation in rare earth recycling, nano-particles classification in size, magneto rheology applications, Electro Magnetic forming

APPLIED SUPERCONDUCTIVITY

Since year 1991 ANTEC has design and manufactured superconducting magnets. The first SC for and accelerator was a Superconducting Tuning Quadrupole prototype for CERN. **ANTEC Magnets** also signed an agreement with the MIDAS programme (Mobilisation of Research, Development & Application of Superconductivity), with ICMA (Institute of Material Science of Aragon) and with CEDEX (Experimentation Centre of the Ministry of Public Works) for the study, calculation, design and manufacture of superconductor coils and the associated cryogenics.

ACICA delivered to CERN a superconducting magnet test cryostat of 2 m diameter and 3 meters high.

ANTEC Magnets manufactured the liquid helium cryostat and the first Spanish Superconducting Solenoidal coil with a 10 Tesla magnetic field at 2 K.



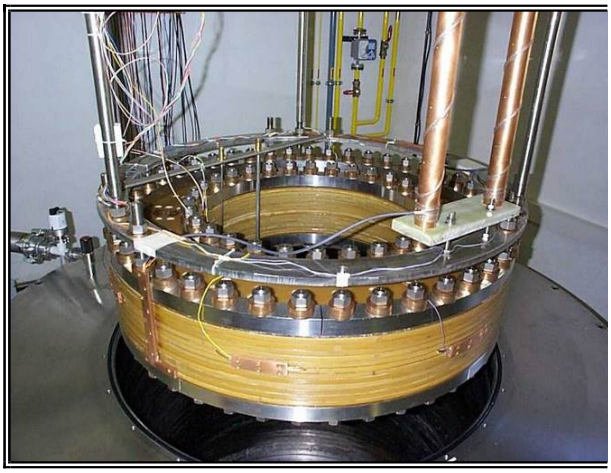
Solenoidal Superconducting Coil + Support + Cryostat

Up to date, **ANTEC Magnets** has completed different NbTi solenoid superconducting coils with 9, 8 and 7 Tesla magnetic fields high magnetic homogeneity, plus the Cryostats and Special Supports required for their use in lab applications as Hall quantum Effect and other ICMA and CEDEX projects.

Study, design and manufacture of a Superconducting coil with its cryostat for the fabrication of a Resistance Pattern and to the measurement of electrical voltage units with an accuracy of 10^{-3}, one hundred times greater than previously known.

A complete 25 Kj SMES (Superconductor Magnetic Energy Storage) was delivered to ASINEL (coil, cryostat and support) for research into applications in this field by domestic electricity companies.

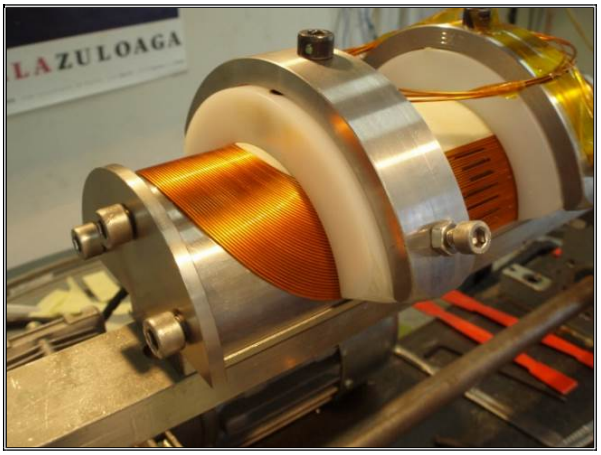
ANTEC Magnets also worked on the calculation, design and construction of a 1 Mj SMES.



1 MJ Superconducting Magnet and Cryostat

To carry out all these projects **ANTEC Magnets** built a 250 m^2 clean room with the equipment required to manufacture coils, magnetic circuits and cryostats.

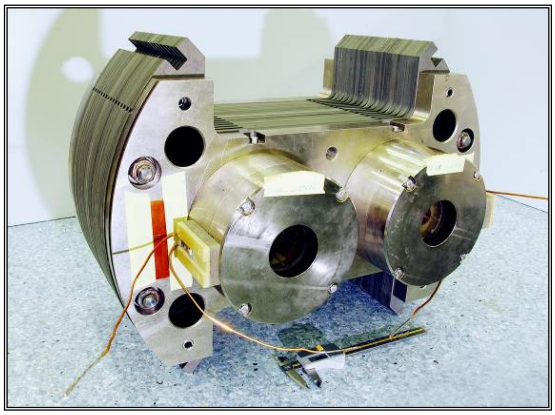
ANTEC Magnets collaborated with CERN in the fabrication and testing of different prototypes of Superconducting Corrector Magnets for the LHC Project as Sextupoles, Octupoles and Decapoles mainly, in collaboration with CIEMAT.

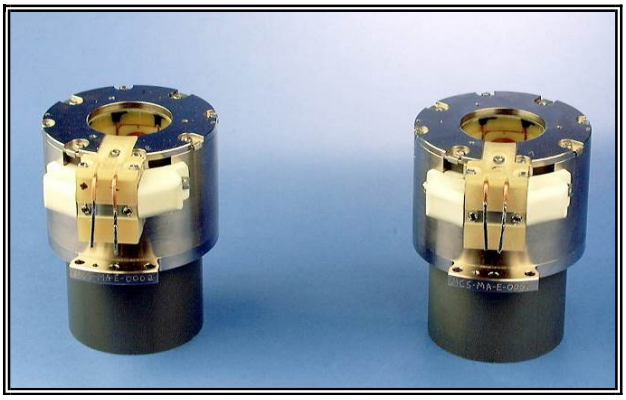


MQTL Prototype of Superconducting Quadrupole for LHC (CERN)

For LHC (CERN):

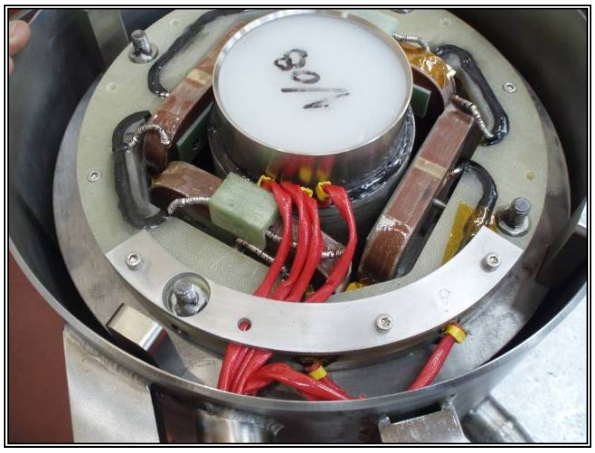
- Manufacturing and testing (magnetic and cold) of 1.600 Corrector Sextupole Magnets (of the Main Dipole) that were delivered to CERN at a rate of 40 units per month
- Manufacturing and testing (magnetic and cold) of 200 Twin Corrector Octupole Magnets (of the Main Quadrupole) that were delivered to CERN at a rate of 10 units per month.





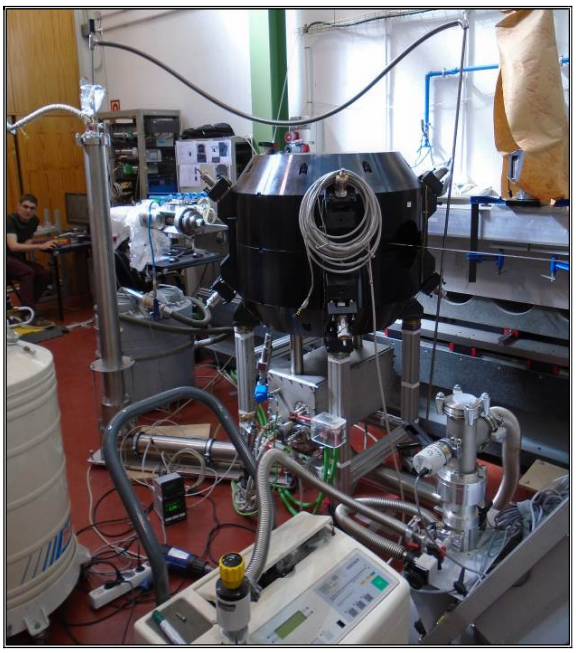
Twin Superconducting Octupole and Superconducting Sextupole Correctors Magnets LHC

ANTEC Magnets has manufactured a series of 103 combined superconducting magnets (2 dipoles + 1 superferric quadrupole) for X-FEL. This Project has been delivered in collaboration with The Vacuum Projects (vessels).



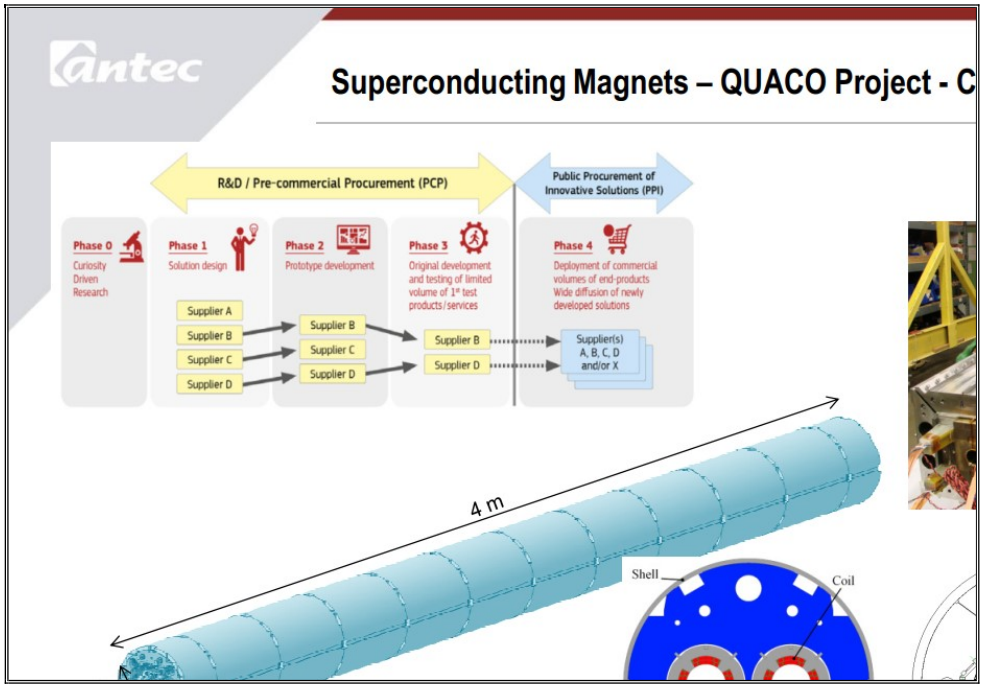
X-FEL Combined Superconducting magnet

ANTEC Magnets has participated in the design and manufacture of a Superconducting compact cyclotron for radioisotope production for PET medical applications in collaboration with Ciemat. This project was funded by the Spanish Ministry of Science and Innovation. The aims of this Project is the fabrication of a low cost system of small size (~Ø800 x 800 (h)), low dose rate at 1 meter, both neutron and gamma, sufficient energy for the production of PET isotopes of interest (~8.5MeV) and sufficient current to produce mono-dose of radio pharmaceutical on request. In 2019 a start-up, CYCLOMED, was established and is currently working on the exploitation of this system.



Superconducting Compact cyclotron

ANTEC participated on a PCP project for CERN, regarding the HI-LUMI upgrade project for the LHC, designing a 4m magnet and developing a new manufacturing concept (based in the Bladder & Keys technology) for the double aperture MQYY superconducting quadrupole. We had successfully overcome the first phase (conceptual design) and participated in Phase 2 (manufacturing design and demonstrators).

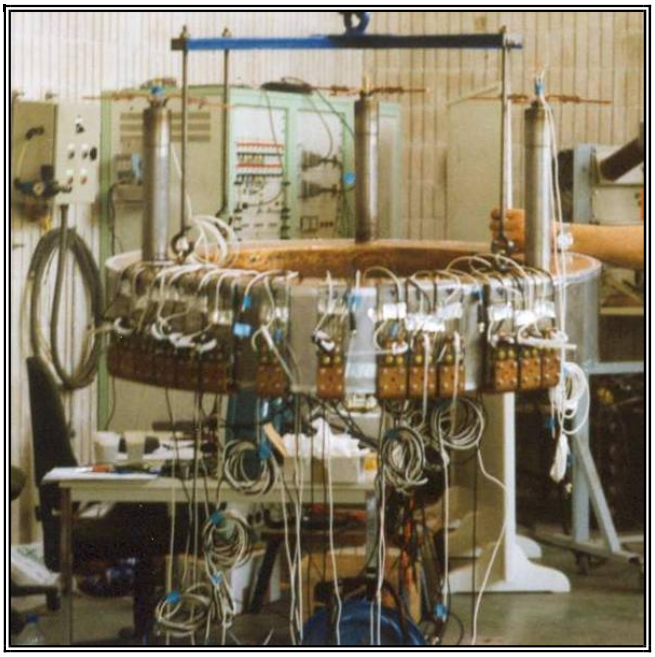


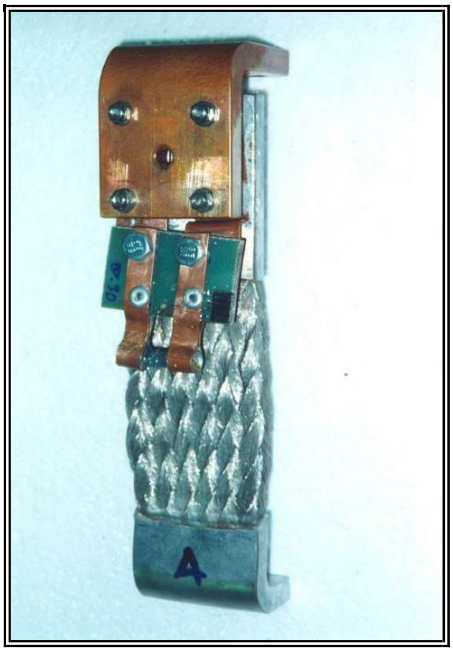
HTS PROJECTS

ANTEC Magnets has delivered a prototype of a 600 Amps HTS Current Lead for LHC (CERN).

HTS 600 A Current Leads for LHC (CERN)

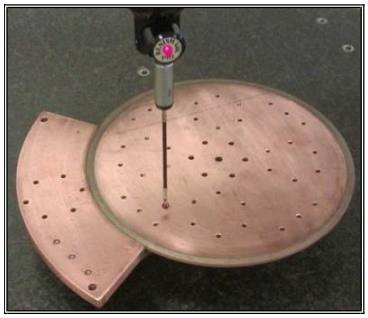
In the frame of a European frame Project, ANTEC has designed and manufactured an HTS Fault Current Limiter for current limitation in electric grids.





HTS Fault Current Limiter under tests and HTS YbaCuO Element

Since 2011 **ANTEC Magnets** is working with new superconducting materials as the MgB_2; designing coils, tools and winding procedures for cryogen free refrigerated coils. This work has being developed with TECNALIA.



PRODUCTIVE MEANS

- Winding machines
- Vacuum pressure impregnation
- Curing ovens
- Dimensional control
  - –CMM 1000 x 1200 x 500 (h) mm 3
  - –CMM 500 x 500 x 400 (h) mm3
- Electrical tests
  - –RLC bridges
  - –Data acquisition system
  - –Dielectric tests
  - –Mass insulation tester
  - –Short circuit tests
  - –Power supplies
- Hydraulic tests