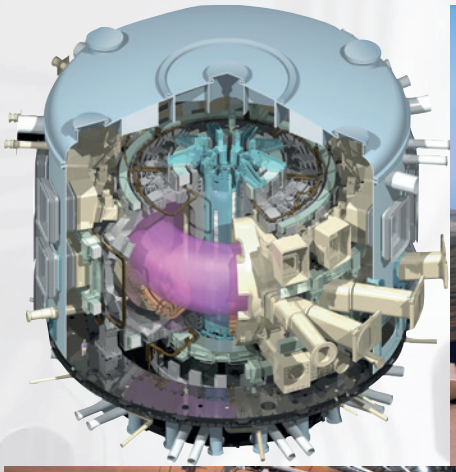
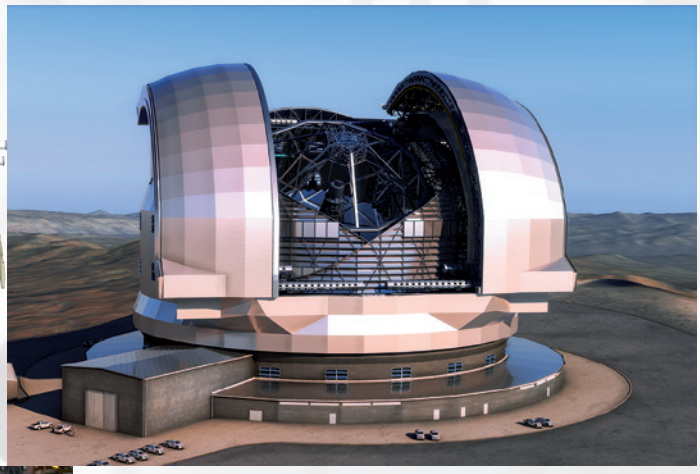
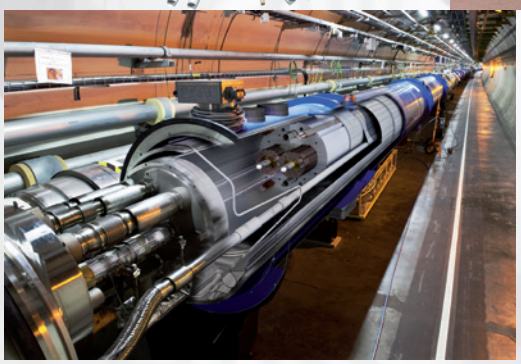
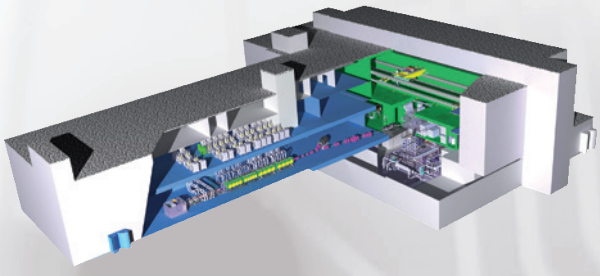
# SPANISH CAPACITIES IN LARGE SCIENTIFIC FACILITIES









MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD

CDTI Centro para el Desarrollo Tecnológico Industrial

@CDTIoficial

IFMIF DONES SPAIN

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The catalogue includes companies with capacity to deliver technology to Large Research Infrastructures, but there may be others with similar expertise. For more information, you can contact CDTI.

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**Edited by:** Centro para el Desarrollo Tecnológico Industrial, E.P.E. (CDTI-E.P.E.)

C/ Cid, 4 28001 Madrid (Spain)

**Legal deposit:** M-23446-2017

July 2017

# Index

# Foreword

The future prosperity of Europe, in an increasingly competitive, globalized and knowledge-based economy, depends upon fully exploiting the continent's potential for scientific and technological innovation. To do this requires high quality educational and research institutions, a strong focus on skills, and access to the highest quality of facilities for research. Large infrastructures are the backbone of European science. They attract the most brilliant technologists and scientists from various scientific disciplines and act as catalysts for the development of new concepts and theories. The discovery of the Higgs boson has been and emblematic example of how Europe has led a collective effort to explain the origin of mass, one of the most profound mysteries of Physics. Beyond their contribution to science, Large International Infrastructures also serve to promote economic development within those countries involved in their construction, favoring the development of more competitive economies and stimulating economic recovery in times of crisis, as driving forces of the economy, as their design and construction requires the development of new technology solutions, and this improves companies' competitiveness and international projection.

For a medium-sized country like Spain, the involvement in facilities at the frontier of knowledge and technology is a driver for promoting international collaboration, demonstrating capacities in the execution of very singular projects and assessing our R&D policy through the challenges imposed by the technology requirements often demanded by these facilities. But all these benefits can be improved if the country hosts the facility and in this sense, Spain has recently expressed interest in hosting IFMIF-DONES infrastructure that will help to test materials in an environment mimicking the conditions of the Demonstration fusion reactor (DEMO), the machine that will come after ITER. CDTI is totally committed with the Spanish proposal and is actively participating in the Spanish national Commission created to coordinate the efforts required to develop the Spanish candidature. In particular, to pave the way for facing the technological challenges, CDTI has been funding Spanish companies R&D projects oriented to IFMIF-DONEs worth in more than 9,4 Million euros during the last ten years.

Without a doubt, the participation of Spain in Large Research Infrastructures has deployed the enormous potential of what have been called the "Science Industry": a set of specialized providers that are essential for the construction, equipment and operation of scientific infrastructures and it's also linked to the major advancement of Spanish science over the recent years. Spanish Science Industry participates in the development of high added value activities in a competitive and international environment and this allows our industry not only being prepare to bid for future contracts but also transferring technology to other Large Research Infrastructures or even to other sectors in a cross-fertilization process.

This catalogue summarizes the capacities of Spanish companies in Large Research Infrastructures and includes not only a selection of recent success stories but also a complete picture of the skills and competitiveness of our national industry. With a consolidated industrial sector in this field, Spanish companies are willing to play a major role in the future, pushing forward technological breakthroughs. But they are also engaged in using the resulting know-how to expand their business with a proactive attitude and with a clear international dimension.

We hope that scientists, companies and Research Infrastructures, as well as future partners will find this compendium useful and that many successful partnerships will be encouraged to successfully face the challenges and opportunities ahead of us.

Francisco Marín Pérez
Director General of the Centre for the Development of Industrial Technology, E.P.E. (CDTI-E.P.E.)

**COMPANY NAME** CDTI (Centre for the Development of Industrial Technology)-E.P.E.[1]

**AFFILIATION** Ministry of Economy, Industry and Competitiveness

**ADDRESS** Cid, 4 28001 MADRID (SPAIN)

**WEB** www.cdti.es

**CONTACT PERSONS**

**ASTRONOMY:** Javier Echávarri — **Email:** javier.echavarri@cdti.es

**FUSION:** Belén del Cerro — **Email:** anabelen.delcerro@cdti.es

**PARTICLE PHYSICS:** Manuel Moreno — **Email:** manuel.moreno@cdti.es

**PHONE:** +34 915 810 491

## CDTI main activities

CDTI is a public entity, under the Spanish Ministry of Economy, Industry and Competitiveness, supporting industrial research and innovation of Spanish companies including Space and Large Scientific Facilities activities. CDTI runs these activities from its HQ in Madrid as well through its international network present in 28 countries worldwide.

## CDTI and Large Research Infrastructures

CDTI promotes the participation of Spanish Industries in Large R&D Facilities such as CERN, ITER, ESRF, ILL, ESO, SKA, FAIR, XFEL and ESS. CDTI is the "Spanish Industrial Liaison Officer" (ILO) for all of them, covering the following activities:

**1. With Industry**

- Raising awareness and informing potential suppliers about medium-terms plans of the Research Infrastructure and forthcoming call for tender
- Supporting R&D projects related to Large Research Infrastructures
- Assisting companies in their understanding of the technical, contractual and financial requirements to become a supplier and helping them to form consortium
- Following up of awarding contracts

**2. With Research Infrastructures**

- Advising Research Infrastructures on the national industrial capacities
- Supporting the international /national Research Organization to create collaborations and partnerships with industry in the R&D phase and promoting technology transfer activities
- Providing advice on the definition and implementation of the Organization purchasing rules

1 E.P.E.: Entidad Pública Empresarial (Public Entity)

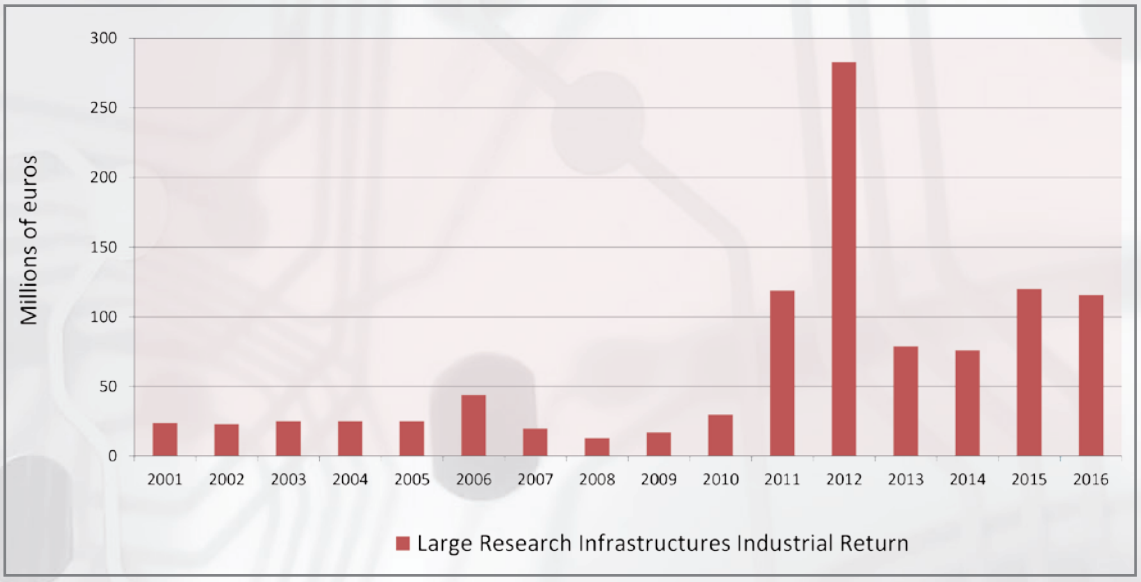
- Organising Industrial Infodays in collaboration with the Research Infrastructure

**3. With Delegations / Funding agencies**

- Collaborating with the Spanish delegation to the Research Infrastructure as the nominated expert for industrial matters
- Advising national funding agencies in the definition of in-kind contributions

## Spanish companies in Large Scientific Facilities

During the last 15 years, Spanish industry has been awarded over 1000 million euros in Large Scientific Facilities[2], won in a highly competitive market without rules of guaranteed georeturn. Our national industry has contributed to the main technological areas of these projects: mechanical engineering, control systems, electro-magnetism and superconductivity, power systems, radiofrequency systems, cryogenic and vacuum systems, electronics, civil and electrical engineering, targets, detectors and instrumentation and sources, radioactivity protection, etc.




Spanish Large Scientific Facilities contract evolution

The previous figure shows a rising tendency in the contracts volume awarded to Spanish companies. There are more than 100 Spanish companies working in this market; the size of the company is clearly interrelated with the organism; for instance there is a large amount of SMEs working for CERN but, on the contrary, there are a lot of large companies working for the ITER project. Although this market covers very different sectors such as particle physics, astronomy or fusion energy, there is a core of Spanish companies working for all these sectors.

## Specific funding tools and services related to large research infrastructures

CDTI supports R&D industrial projects for Large Research Infrastructures and the participation in tenders for research infrastructures.

2 Large Scientific Facilities taken into account: CERN, ESRF, ILL, FAIR, XFEL, ESO, ITER


## IFMIF-DONES, A KEY INFRASTRUCTURE IN THE ROADMAD TOWARDS FUSION ENERGY

**CONTACT PERSON:** Carlos Alejaldre Losilla **Email:** carlos.alejaldre@ciemat.es

In the fusion energy roadmap, the Demonstration fusion reactor (DEMO) will come after ITER. A DEMO starting in around 2030 poses stringent timing requirements for the successful development of neutron resistant materials, as these materials must be qualified in advance of the completion of the DEMO design. A key issue is the effect on the materials of helium embrittlement, particularly important with high energy neutrons, in addition to the displacement damage already observed with a fission spectrum. Whilst a full performance International Fusion Materials Irradiation Facility (IFMIF) provides the ideal Fusion Neutron Source device, as already identified in the Fast Track approach, for testing materials up to radiation damage levels foreseen for a Fusion Power Plant (FPP), the schedule for DEMO under the current European roadmap is such that the tests must start earlier than currently foreseen for a full IFMIF.

In Europe, it has been thus agreed that the selected configuration for a so called Early Neutron Source is the IFMIF-DONES (DEMO Oriented Neutron Source) facility, which is based on a IFMIF-type neutron source with reduced specifications - basically equipping only once accelerator instead of the two initially foreseen for IFMIF.

### SPAIN HAS BEEN SIGNIFICANTLY INVOLVED IN IFMIF THROUGHOUT THE LAST DECADE…

Spain, under the coordination of CIEMAT, is significantly contributing to IFMIF/EVEDA project. The Engineering Design and Engineering Validation Activities (EVEDA) phase of IFMIF, started in 2007 under the framework of the Broader Approach (BA) Agreement between Japanese Government and EURATOM, and was given the mandate to develop an integrated engineering design of IFMIF together with accompanying sub-projects to validate the major technological challenges.

The Spanish contribution (in-kind) to IFMIF/EVEDA represents around 20% of the overall project and close to 30% of the European contribution.

Already in this EVEDA phase, the project is having a very positive impact on the Spanish industry, SMEs and the research community involved in the development and construction of several first-of-a-kind technological components. This involvement translates into new knowledge and cutting-edge technology, market-oriented research and innovation and high skilled jobs and knowledge all over Spain.

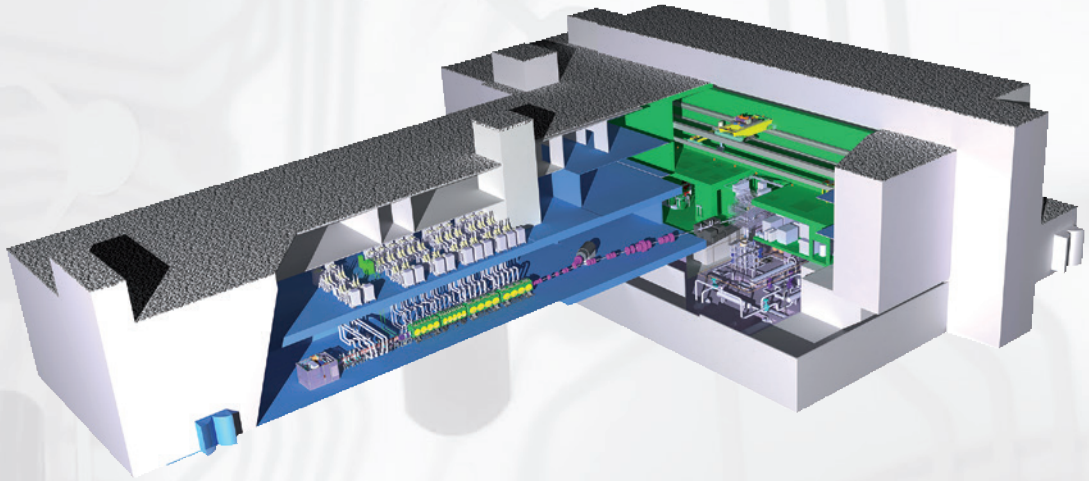
### …AND THEREFORE OFFERS A SOLID CANDIDATURE TO HOST IFMIF-DONES IN GRANADA

The Spanish Government – at the initiative of the Secretary of State of Research, Development and Innovation (SEIDI) within the Ministry of Economy and Competitiveness – set up a Commission to help coordinate the efforts required to develop the Spanish candidature to

host IFMIF – DONES. A comprehensive proposal was prepared by this Commission; detailing the technical characteristics of the site and its infrastructures; as well as covering other aspects such as socioeconomics, licensing framework, waste management and decommissioning, etc. The proposal was jointly prepared, under the coordination of CIEMAT, by contributions from CDTI, CSN, INEUSTAR, OnGranada, Empresarios Agrupados, Vargas Engineering and University of Granada. A Panel of Experts from Fusion for Energy (F4E) visited the site in June 2017, where they could see firsthand the merits of the Spanish proposal. A technical decision on the chosen site is expected to be eventually taken by the end of 2017.

It is no doubt that Spanish industry and its research community is ready to face the challenge to build and operate such prestigious facility. It has the required capabilities and knowhow, and the firm and unanimous support from local, autonomic and central governments.

Should the Spanish candidature succeed, the construction and operation of such a facility will have a tremendous positive impact; both in Granada and Spain. Some preliminary socio-economic studies, considering the period extended over construction and operation phases, estimated a return in the order of 900 M€ in the GDP and the creation of some 12,000 jobs-year.



Cut-out 3D view of the DONES Main Building

Bird-Eye 3D view of the DONES site in Granada

# SPANISH COMPANIES

ABENGOA


**COMPANY NAME** ABENGOA
**ADDRESS** C/ Energía Solar nº1, Campus Palmas Altas, 41014 Seville (Spain)
**WEB** www.abengoa.com
**TURNOVER** 5.755 M€ in year 2015
**EMPLOYEES** 14,000 in year 2016
**CONTACT PERSON** Sonia de la Rosa
**POSITION** Head of Aerospace
**PHONE** +34 646 562 989
**EMAIL** sonia.delarosa@abengoa.com
**SME** No


## Company activities and skills:

Abengoa is an international company that applies innovative technology solutions to sustainable development in the energy and industrial sectors.

Aerospace Department activities are the design, manufacturing and validation of electronic equipment for monitoring, control and testing as well as power distribution systems for Defense and Aerospace sectors.

## Large scientific facilities and national research facilities contracts:

[ADS-ESA] Automated Test Equipment for Ariane 6 CMFU and for QUANTUM RX Antenna and GEO-SCAU Unit for Airbus Defence and Space, 2016

[ASIAA] Production and verification of Bias Modules for Band 1 of ALMA (2016)

[ESO] Production and verification of Bias Modules and Cartridge Power Distribution Cards for Band 5 of ALMA (2014)

[ESO] Design, Production and validation of Automated Test Equipment for Bias Modules and Cartridge Power Distribution Cards for Band 5 of ALMA (2014)

[ASD-ESA] Automated Test Bench for Ariane 5 Launcher Electronics Airbus Defence and Space (2014)and Test Bench for Meteosat Third Generation (MTG) Power Distribution Unit for Airbus Defence and Space (2013)

[CERN] Design, Manufacturing and Test of Power Supplies for CERN, DO-(27885 and DO-27770 projects (2013)

## R&D Projets:

[ESA] TRP for improving the efficiency in energy generation of great installations 'Loop Heat Pipe (LHP) Technology for Solar-Dynamic Energy Conversion (2016)

[ESA] TRP for Biodegradable Materials for Launchers Systems (2014)

[ESA] TRP for Environmentally Friendly Hydrogen Production (2013)

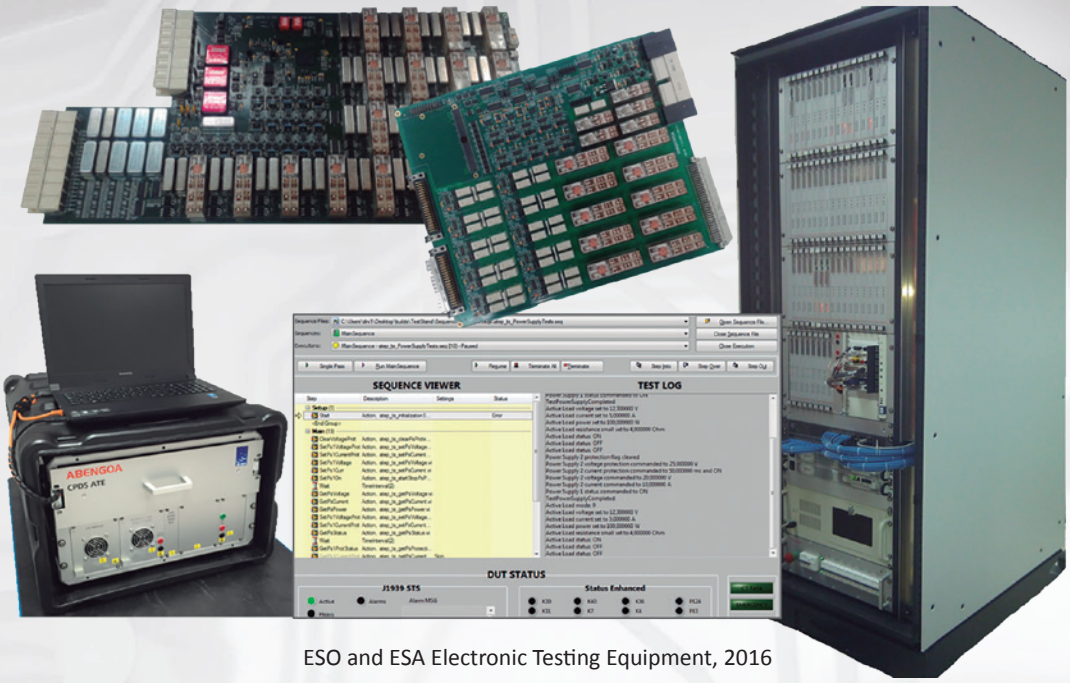
[ESA] GSP for Terrestrial & Space Energy Technology Roadmap (2013)

## Markets:

Naval / Aeronautics / Space / Energy / Defense

## Quality certifications, nuclear qualifications:

ISO 9001, ISO 14001, PCAL-AQAP 2120, UNE 166002R&D, OHSAS 18001




ESO and ESA Electronic Testing Equipment, 2016

Facilities for Aerospace department

| | |
|---|---|
| **COMPANY NAME** | **AERNNOVA AEROSPACE, SAU** |
| **ADDRESS** | **c/ Leonardo da Vinci, 13, Parque Tecnológico de Álava, 01510 Miñano, Álava (Spain)** |
| **WEB** | **www.aernnova.com** |
| **TURNOVER** | **601 M€ in year 2015** |
| **EMPLOYEES** | **4,300 in year 2015** |
| **CONTACT PERSON** | **Miguel Ángel Castillo** |
| | **POSITION VP Technology Director** |
| | **PHONE +34 913 827 844** |
| | **EMAIL miguelangel.castillo@aernnova.com** |
| | **SME No** |

**Company activities and skills:**

AERNNOVA is a Leading Aerostructures Tier -1 Company focused on the Design and Manufacturing of Major Aerostructures, such as Wings (Central and Outer Main Torque Boxes, Flaps, Ailerons and Spoilers), Empennages (Vertical, Horizontal Stabilizers, Ruder and Elevators) and Rear Fuselages for Civil and Military Aircraft.

Our capabilities enable us to assume full responsibility of the programs over the Product Life Cycle: From Conceptual and Detail Design, Testing & Certification to Serial Production and in Service Support. We can also perform each of these activities separately, adapting to the needs of our clients.

Aernnova offers a flexible Scope of Activities and Services adaptable to customer needs:

- Design & Build. Full Responsibility over the Product Life Cycle From Conceptual and Detail Design, Testing and Certification to Serial Production and in Service Support
- Design to Build. Engineering Services, mainly through Complete Work Packages, including Concurrent Design & Manufacturing Engineering (Most Efficient Solutions)
- Build to Print. Transfer, Industrialization, S. Chain, Assembly and Final Delivery, usually with Design Maintenance, MRB and Product Support

In order to strengthen its Efficiency, Management Control, Growth and Competitiveness, Aernnova has organized its activities according to the different technologies and capabilities required, combining the Management by Programs and by Business Units:

- STRUCTURES. Integral management of complete aerostructures (Wings, empennages, rear fuselages sections, nacelles): conceptual design, design and development, testing, certification, prototypes and in-services support.
- Engineering. Engineering specialized in Product and Systems Engineering, Manufacturing Engineering.
- Composite. Composite detailed part fabrication. Composites Components and associated Assemblies (ATL, RTM, FW...).
- Metallic. Metallic detailed part fabrication. Metallic Components, Surface Treatments and Sheet Metal Forming.
- Product Support. Repair and Product Support. Repair, Spare Parts and Technical Support.

Aernnova internal know-how and expertise in Light Weight Structures Design, Stress Check, FEM method, Fatigue and Damage Tolerance analysis, Materials and Processes selection,

Quality Management and Configuration Control are applicable for the development of ITER Fusion related Activities.

**Large scientific facilities and national research facilities contracts:**

N/A

**R&D Projets:**

The Main Aernnova R & D Projects in Large Research Infrastructures are:

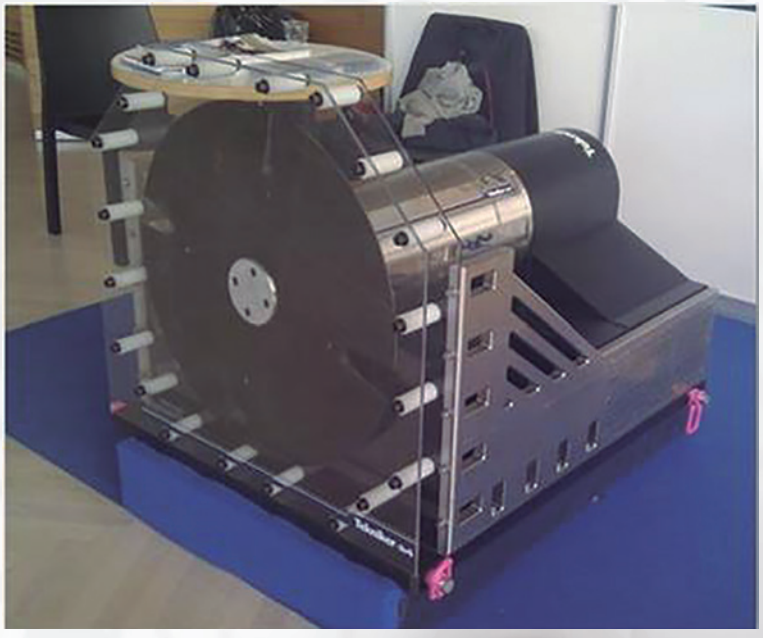
- IÑUDE- Chopper design and manufacturing.
- DINA- Discs for Advanced Neutronic Investigations.
- IMPRIME- Strategic advancements on materials through digital printing.

**Markets:**

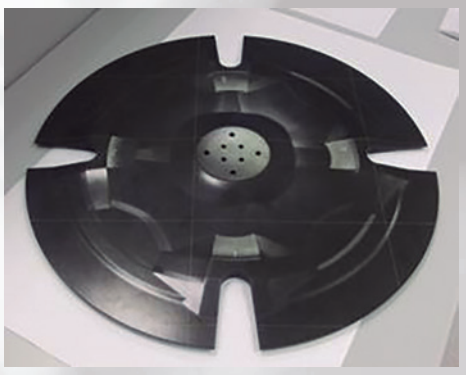
Aeronautics

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001



Disc With Tekniker Spindle



Finished Disc


**COMPANY NAME** AIMEN TECHNOLOGY CENTRE
**ADDRESS** Relva 27 A, Torneiros, 36410 O Porriño, Pontevedra, Spain
**WEB** www.aimen.es
**TURNOVER** 12,8 M€ in year 2015
**EMPLOYEES** 220 in year 2015
**CONTACT PERSON** Joaquín Vázquez
**POSITION** Sales Director
**PHONE** +34 986 344 000
**EMAIL** jvazquez@aimen.es
**SME** Yes


## Company activities and skills:

AIMEN is an Innovation and Technology Centre founded in 1967 in Vigo on the initiative of a group of Galician entrepreneurs. Today, we are a national leader in research and in providing advanced technological services in the fields of joining technologies, materials and laser technologies applied to materials processing and a sought-after partner in international research projects.

Over 50 years in the service of industry, combined with our technical experts' high levels of specialisation and the unique nature and excellence of our facilities, endorse the quality of our multidisciplinary and multi-sectoral technological offer.

We carry out our own research, and also partner with companies on R&D projects aimed at developing new technologies and incorporating technological improvements into their products and/or processes, including the development of prototypes and demonstrators. Aligned with a common purpose: to maximase business and industrial performance.

Our specialization areas in R&D are: Advanced Materials, Robotics & Control, Advanced Manufacturing Processes and Environment.

Our unique services offer advanced, innovative and differentiating solutions that add value to products and processes and, ultimately, help to our clients become more competitive.

Our specialization areas in Industrial Services are: Manufacturing Engineering, Numerical Calculation and Simulation, Mechatronics.

Our laboratories are backed by many official accreditations and recognitions that guarantee our impartiality and technological capabilities.

## Large Scientific Facilities And National Research Facilities Contracts:

Equipos nucleares s.A. | On-site machining technology development implementing of the project " ocz8 - iter vacuum vessel and port structure welding". 2015-2016

Equipos nucleares s.A. | Backing gas system applied in welding process project "0cz8 - iter vacuum vessel and port structure welding". 2014

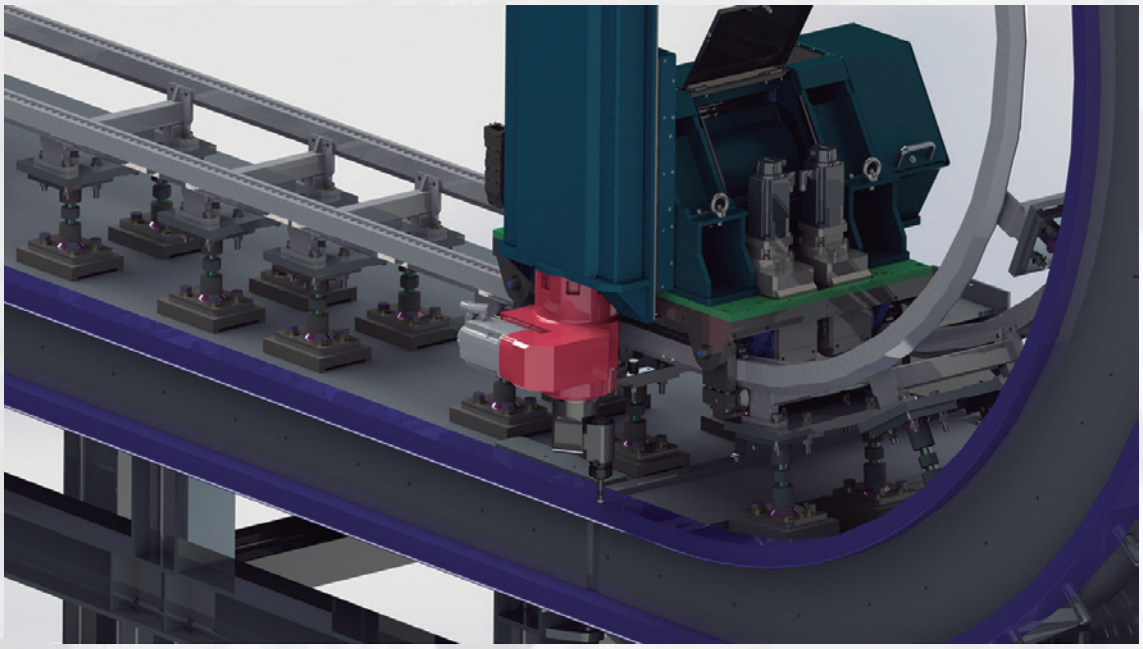
Equipos nucleares s.A. | Design and development of rt inspection procedures and system for its application in joints welded by ensa in the project "0cz8 - iter vacuum vessel and port structure welding". 2014

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy / Oil & gas

**Quality Certifications, Nuclear Qualifications:**

ISO 9001, ISO 14001



System prototype joints in situ machining for Vacuum Vessel

**COMPANY NAME** AIRBUS DEFENCE AND SPACE, S.A.U.
**ADDRESS** Avenida de Aragón 404, 28022 Madrid, Spain
**WEB** www.airbusdefenceandspace.com
**TURNOVER** 102 M€ (Space Systems Division) in year 2016
**EMPLOYEES** 421 (Space Systems Division) in year 2016
**CONTACT PERSON** María del Mar Fernández Lisbona
**POSITION** HO Commercial, Strategy and Institutional Relations
**PHONE** +34 915 863 778
**EMAIL** mar.fernandez@airbus.com
**SME** No

### Company activities and skills:

Design and manufacturing of state-of-the-art space technologies satellites and launchers, including design of structures for very stringent environments and antenna subsystems (both arrays and reflector antennas).

### Main contracts in Astronomy facilities:

### Large Scientific Facilities And National Research Facilities Contracts:

Selected contracts of potential interest to Astronomy facilities

- [ARIANESPACE] ARIANE 6 structures (2019 - Onwards)
  - Payload Attachment Fitting (PAF)
  - Launch Vehicle Adapter (LVA)
  - Interface Structures (IFS 1+2)
  - Equipped Solid Rocket Upper Part (ESR UP)
- [ARIANESPACE] ARIANE 5 structures (1999 - Present)
- [ESA] JUICE structure, shielding and thermal subsystems (2018)
- [ESA] Cheops structure and prime for the whole satellite (2017)
- [Fusion for Energy] ITER Pre-compression rings (in glass fiber) (2013 - Present)
- [ESA] GAIA active antenna (2012)
- [ESA] GAIA satellite structure (2010)
- [CERN] Large Hadron Collider Support Posts (4600 items delivered) (2011)
- [CERN] Cylinder for the ATLAS experiment of the LHC (2011)

### Selected R&D projects of potential interest to Astronomy facilities:

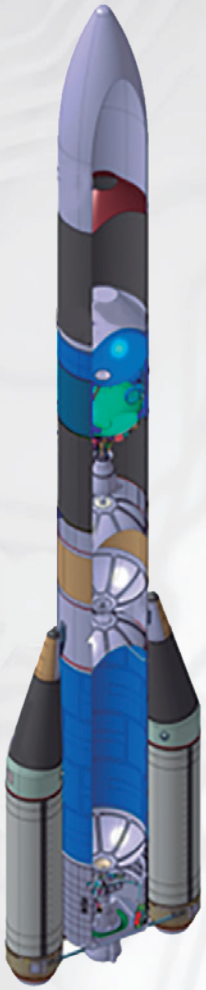
- [FP7] EUCARBON (2016)

### Markets:

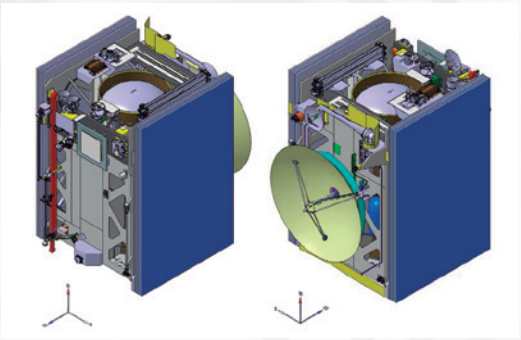
Space

### Quality Certifications, Nuclear Qualifications:

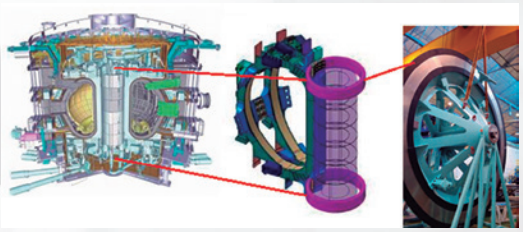
ISO 9001



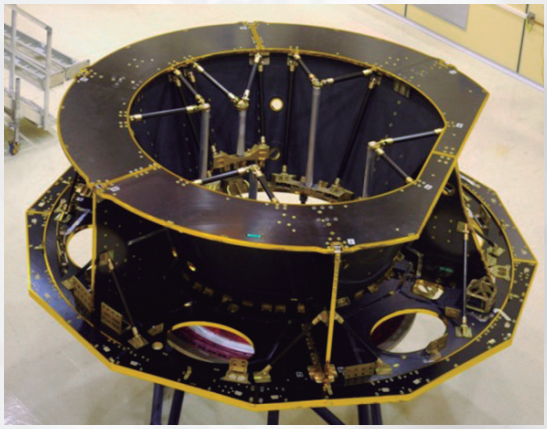
Ariane 6



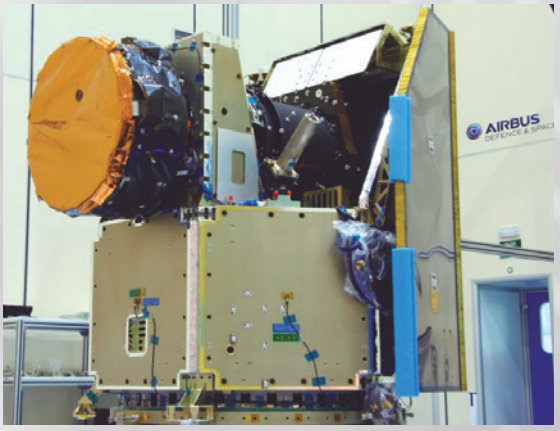
JUICE. SSTS



ITER rings



GAIA. Structure




CHEOPS

SMARTER, SAFER, STRONGER


| | |
|---|---|
| **COMPANY NAME** | **ALE HEAVYLIFT IBERICA S.A.** |
| **ADDRESS** | **P.I. Los Frailes, Crtra Alcala de Henares a Daganzo. Daganzo de Arriba 28814 Madrid** |
| **WEB** | **www.ale-heavylift.com** |
| **TURNOVER** | **121 M€ in year 2016** |
| **EMPLOYEES** | **1,718 in year 2015** |
| **CONTACT PERSON** | **Alberto Quijano Rojo** |
| | **POSITION Account Manager** |
| | **PHONE +34 636 597 021** |
| | **EMAIL a.quijano@ale-heavylift.com** |


**Company activities and skills:**

ALE is one of the world's major international heavy transport and installation contractors with a global network of operating centres and a large fleet of heavy cranes, specialist transport and installation equipment. As a complete solution provider for lifting, transporting, installing, ballasting, jacking and weighing large, heavy loads, organisations all over the world turn to us to push the boundaries of what's possible with their high profile projects. Investment in technology, systems and equipment ensures we stay ahead: for example, our dedicated R&D facility is responsible for the Innovation Series, including equipment such as the AL.SK crane fleet and the Mega Jack system.

By investing as much in our people as we do in equipment, we have a world-class Combining exceptional project management with engineering intelligence, ALE offers worldwide heavy transportation and lifting services to all industry sectors. The company was founded in 1983 and has expanded steadily through a balanced strategy of organic growth and acquiring key companies whose experience enhances our specialist capabilities.management structure to support our technical potential. So as well as having the best project managers and engineers available today, we'll have the best tomorrow, too.

By achieving maximum value from our next-generation equipment, we can effectively meet your requirements, building long-term strategic partnerships for an everimproving service.

**Large Scientific Facilities And National Research Facilities Contracts:**

Awarded main contract awarded:

Anav/ 2015 transport and storage of the main reactor head at vandellos npp Spain

Iter/f4e/ 2015 lifting gantry for the lifting of main coils in cadarache, france

Siemens/ 2015 transport and installation of main components as turbine and generators in 2 power plants of total 4800 mw in egypt

**R&D Projects: other projects**

Lifting offshore wind protype in canarias

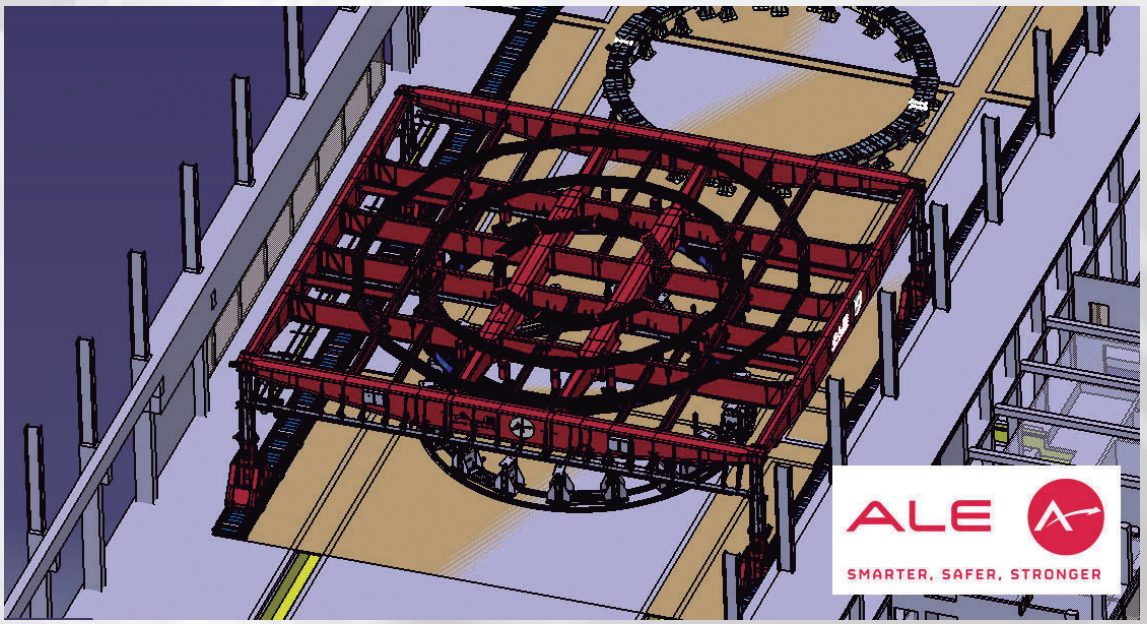
**Markets:**

Nuclear / Naval / Energy / Oil & gas / Civil - Offshore - Renewables

**Quality Certifications, Nuclear Qualifications:**

ISO 9001, ISO 14001


Transport of the reactor head using spmt




Lifting gantry for the main coils in iter


**COMPANY NAME** ALTER TECHNOLOGY TUV NORD
**ADDRESS** c/ La Majada 3, 28760, Tres Cantos, Madrid
**WEB** www.altertechnology.com
**TURNOVER** 45 M€ in year 2016
**EMPLOYEES** 130 in year 2016
**CONTACT PERSON** Rafael Rodríguez
**POSITION** Program Manager
**PHONE** +34 918 064 663
**EMAIL** Rafael.rodriguez@altertechnology.com
**SME** No

### Company activities and skills:

ALTER TECHNOLOGY TÜV NORD SAU (hereafter ATN), a member company of TÜV NORD GROUP, is a quality driven company providing procurement, engineering and test services for electronic systems, equipment and E.E.E. components, within the space and harsh environment markets. ATN works in many markets including, but not limited to, Aerospace, Security, Transport, Energy, Health & Safety and Automotive.

TÜV NORD is a technical service provider with worldwide activities. With around 14.000 employees, is one of the largest technical service providers and it is present in over 70 countries in Europe, Asia, Africa, and the Americas. TÜV NORD is a reference in the provision of consultancy, testing and inspection services for the Industry.

### Large Scientific Facilities And National Research Facilities Contracts:

ATN has a very large experience as prime contractor within the European Space Agency (ESA) for the engineering and reliability testing of components for harsh environment application covering all range of technologies.

2017: ESS Interlock system: ATN currently bidding for the ESS new big science installation in Lund, for the Interlock design and IEC 61508 Functional Safety Analysis.

2015-2018: F4E-OMF-0555, ATN awarded with the contract for supporting F4E to develop internal control & compliance procedures for cxport control and Dual Use components.

2015-2018: ITER - CFT_11268, ATN awarded for the Discharge Loop interface box (DLIB) design, qualification and validation and manufacturing of 150 units.

2014-2018: F4E-OMF-43, ATN awarded with the provision of support to the F4E ITER Department and Project Office Unit in the area of Project Management (F4E-OMF-43),and in particular the LOT 5, CE marking support.

2014: ATN as prime contractor for the R&D consortium that develops the Linear Accelerator of Particles which will be built in the Science Park of Aljaraque (Huelva, Spain). These project management and technical capabilities are subject to be transferred to the Fusion for Energy (F4E) scope.

2014: ATN has performed the Helium vessels inspection for DESY XFEL (X-Ray Free-Electron Laser) for CIEMAT.

## R&D projects:

ATN provides engineering services regarding regulatory and product conformity requirements, particularly regulation application and product certification as well as dedicated engineering and testing services for components evaluation for harsh environments, as for the product assurance services: Environmental conditions, reliability/ functional safety analysis, engineering, EMC testing, radiation and magnetics, radio communications and optical testing.

2014-2018 Several R&D ESA Projects: EUCLID, Slogan GaN technology, MTG Meteosat new satellites, MultiPurpose Crew Vehicle (Orion MPCV), etc.

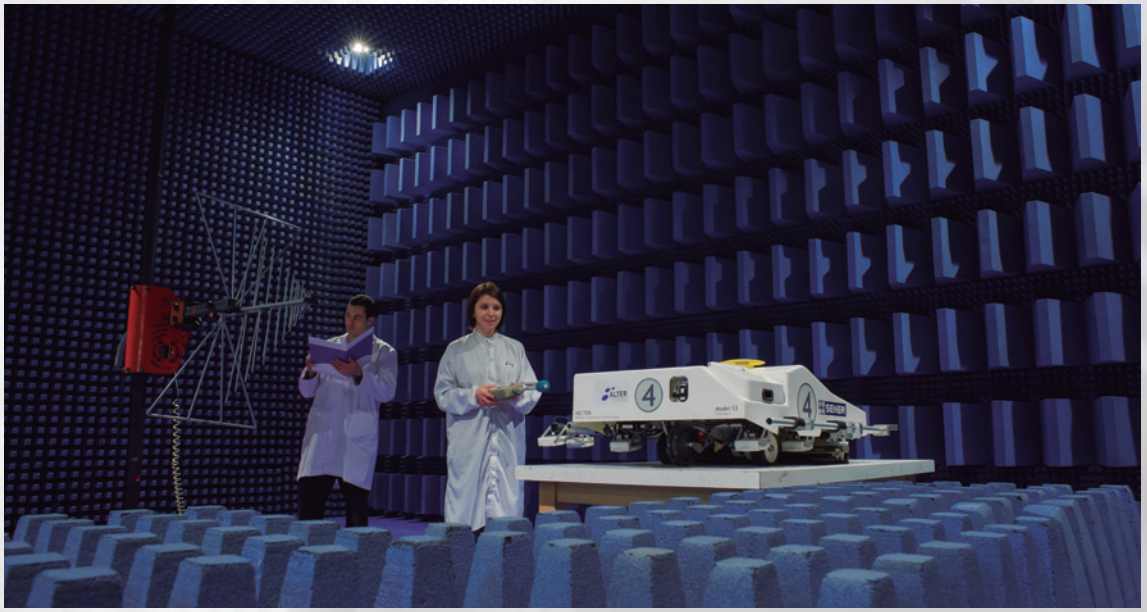
2014: ATN as prime contractor for the R&D consortium that develops the Linear Accelerator of Particles which will be built in the Science Park of Aljaraque (Huelva, Spain). These project management and technical capabilities are subject to be transferred to the Fusion for Energy (F4E) scope.

2014: ATN has performed the Helium vessels inspection for DESY XFEL (X-Ray Free-Electron Laser) for CIEMAT.

## Markets:

Nuclear / Aeronautics / Space Defense / Automotive / Energy


Environmental and safety test



Magnetic, radiation and EMC test

| | |
|---|---|
| **COMPANY NAME** | **ANÁLISIS Y SIMULACIÓN, S.L.** |
| **ADDRESS** | **C/ Leonardo da Vinci, 14, edificio PIE**<br>**Parque Tecnológico de Álava 01510 Miñano (Álava), Spain** |
| **WEB** | **www.analisisysimulacion.com** |
| **TURNOVER** | **4.5 M€ in year 2015** |
| **EMPLOYEES** | **42 in year 2015** |
| **CONTACT PERSON** | **Mario Díaz** |
| | **POSITION Deputy Director** |
| | **PHONE +34 902 105 496** |
| | **EMAIL mario.diaz@analisisysimulacion.com** |
| | **SME Yes** |

**Company activities and skills:**

ANÁLISIS Y SIMULACIÓN S.L. is a company with 20 years experience in the market (founded in 1997).

We are a company involved in the mechanical engineering, with experience and know&how in different fields of the mechanical engineering: conceptual design, industrial development -CAD 3D, drawings, BOM, APQP and FMEA methodologies,...- but highly focused and with deep experience and know&how in the fields of numerical simulation (structural, fluid dynamics and manufacturing processes); instrumentation & data acquisition & data analysis; computer aided manufacturing (CAM) for substractive manufacturing; and additive manufacturing (metal and plastic).

We are working in the business of software implementation and in the business of mechanical engineering services.

In the business of software implementation we are the leading company in Spain to supply and implement cutting edge engineering solutions from the leading global companies:

- Product development and innovation (CAD-structural CAE and CFD)

- Manufacturing processes optimization (CAM-manufacturing CAE)

- Product Data Management (PDM) – Product Lifecycle Management (PLM)

- Additive Manufacturing

- IT hardware

In the business of mechanical engineering services we are a company well recognized in the market.

Our solutions and services applied to the industrial sector give us the possibility to deliver a great value to our Customers, in their products and / or processes, reducing economic costs and improving the productivity and competitiveness. We put together knowledge, methodology and commitment to the Quality and the Customer.

With our 20 years background working together with societies, clusters, universities and training centers, we offer a yearly schedule of “open/standard training courses” and we offer, too, “Ad Hoc training courses” designed to provide exclusive knowledge to the companies.

Our staff, 45 engineers / technicians, has a lot of years of experience and knowledge in the main industries: space, aeronautic, automotive, wind energy, railway, biomechanic,…

**Large scientific facilities and national research facilities contracts:**

[ESA] metop-sg series mission (2016): mechanical and thermal analysis of telecommunications units

[ESA] euclid mission (2016): mechanical analysis of scientific instrument

[ESA] mtg series mission (2014): mechanical and thermal analysis of telecommunications units

[ESA] smallgeo mission (2011): mechanical and thermal analysis of telecommunications units

[ESA] galileo mission (2006): mechanical and thermal analysis of telecommunications units

[ESA] smos mission (2002): mechanical and thermal analysis of telecommunications units

**R&D projects:**

2011-2013: HIMAT project (Lightweight parts with hybrid materials for zero emissions vehicle) of the Basque Government ETORGAI program.

2011: MACTI project (Advanced manufacturing processes for parts in composite materials for the industry) of the Basque Government ETORGAI program.

2008: INTELIMPLANT project (Advanced biomaterials for a new generation of implants) of the Spanish Government CENIT program.

**Markets:**

Automotive / Aeronautics / Space / Energy / Railway

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001


Liftoff of Ariane flight VA233, carrying four Galileo satellites, from Europe's Spaceport in Kourou, French Guiana, on 17 November 2016.

The SMOS mission makes global observations of soil moisture over Earth's landmasses and salinity over the oceans. Variations in soil moisture and ocean salinity are a consequence of the continuous exchange of water between the oceans, the atmosphere and the land – Earth's water cycle.

ANTEC MAGNETS, S.L.U.

| | |
|---|---|
| **COMPANY NAME** | **ANTEC MAGNETS, S.L.U.** |
| **ADDRESS** | **Ramón y Cajal, 74 – 48920 Portugalete (Spain)** |
| **WEB** | **www.antecsa.com** |
| **TURNOVER** | **750 k€ in year 2016** |
| **EMPLOYEES** | **6 in year 2016** |
| **CONTACT PERSON** | **Rafael Iturbe** |
| | **POSITION General Manager (Magnets)** |
| | **PHONE +34 944 724 164** |
| | **EMAIL r.iturbe@antecsa.com** |
| | **SME Yes** |

### Company activities and skills:

Design and manufacture of warm and permanent magnets, with water or air cooled windings, and high precission laminated or solid magnetic yokes. Main applications such as particle accelerators, magnetic separation and nanotechnology, among others.

Design and manufacture of superconducting magnets for applications such as particle accelerators and medicine, among others.

Design of cryogenic systems.

All necessary facilities avalaible at our workshop, such as: Winding machines, vacuum-pressure impregnating devices, ovens, yoke manufacturing and assembly areas, testing laboratory and a 250 $m^2$ clean working area.

### Large scientific facilities and national research facilities contracts:

- PSB Transfer Line Quadrupole Magnets for the LIU Project (CERN).
- Design and manufacture of dipolar magnets for the variable bunch compressor (VBC) in the second phase of CLARA Project at STFC Daresbury (UK).
- Corrector Magnets for CNAO. 250 Kg. Laminated bonded yokes water cooled coils.
- Combined horizontal/vertical corrector magnets, for the HIE-ISOLDE project (CERN). 50Kg. Solid iron yokes and water-cooled coils wound from hollow copper wire. Stringent dimensional tolerances.
- Quadrupoles for the Gantry 3 facility at Paul Scherrer Institute (Switzerland). Water-cooled coils wound from hollow copper wire, stacked magnetic yokes, Ø100 mm aperture. 730 kg.
- Combined superconducting magnets (2 dipoles + 1 superferric quadrupole) for X-FEL. 103 magnets series.
- Manufacturing and testing (magnetic and cold) of 1.600 Corrector Sextupole Magnets for the LHC (CERN);. rate of 40 units per month.
- Manufacturing and testing (magnetic and cold) of 200 Twin Corrector Octupole Magnets for the LHC (CERN); rate of 10 units per month.

**R&D projects:**

- Design and manufacture of a Superconducting compact cyclotron for radioisotope production for PET medical applications. Project funded by CDTI (CENIT)
- Design and manufacture of a new concept of a wet basis magnetic separator.
- Design of a Superconducting 4m long Quadrupole for Hi-Lumi Project (CERN). Project funded by the UE.

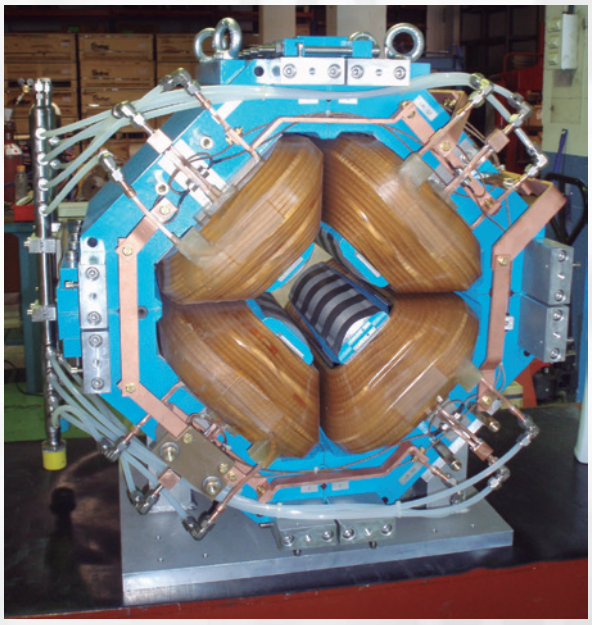
**Markets:**

Nuclear / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001

Superconducting Cyclotron



PSI Quadrupole

| | |
|---|---|
| **COMPANY NAME** | **APPLUS+ LABORATORIES (LGAI TECHNOLOGICAL CENTER S.A.)** |
| **ADDRESS** | **Campus UAB, Ronda de la Font del Carme, s/n, E-08193 Bellaterra (Barcelona) Spain** |
| **WEB** | **www.appluslaboratories.com** |
| **TURNOVER** | **Laboratories Division 55 M€, Applus 1,7 B€ (in year 2015)** |
| **EMPLOYEES** | **Laboratories Division 700, Applus 18,700 (in year 2015)** |
| **CONTACT PERSON** | **Alfons Carpio / Elisabet Ribera** |
| | **POSITION R&D Manager Energy & Transport BU / Corporative Innovation Division** |
| | **PHONE +34 667 185977 / 667167675** |
| | **EMAIL Alfons.carpio@applus.com / Elisabet.ribera@applus.com** |
| | **SME No** |

## Company activities and skills:

Applus+ is one of the world's leading testing, inspection and certification companies. With more than 18,700 employees, we operate a network of more than 350 offices and laboratories in more than 70 countries across the globe.

Applus+ Laboratories division has a network of laboratories in Europe, Asia and USA. Its main technological center is based in Barcelona (Spain). Applus+ Laboratories provides engineering and testing services in several fields like structures, materials, EMC, environmental, vibrations, fire safety, electrical safety, wireless connectivity, IT security, amongst others.

Additionally, Applus+ has extensive experience in developing large and complex test facilities and advanced composite continuous manufacturing proceses.

## Large scientific facilities and national research facilities contracts:

ITER (through Empresarios Reunidos) - Testing and qualification of ITER nuclear security control system electronic components. The project included EMC tests, vibration tests and climatic tests (2015-2016)

ITER – Contract for the Execution of Mechanical Tests on Intercoil Structures at cryogenic temperatures (2016)

ESA (Through NTE) - Vibration & Climatic Test MARES FM2 Battery (2013)

ESA (Through SABCA) - FLPP - Curved panel structural test for Vega launcher (2016)

ESA – Material Testing (Tensile, Compr., Bearing, K1c, Fatigue ) on cone for Vega Lancher (2013-2014)

ESA - Vibration & Shock Test in a Optical System for Euclides project (2015)

## R&D projects:

R&D projects for industrial applications mainly for aeronautics, automotive, payment systens, microelectronics…

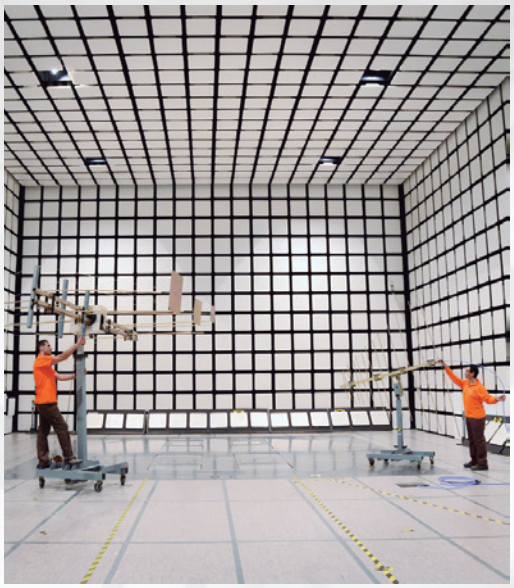
## Markets:

Nuclear / Defense / Automotive / Naval/ Aeronautics / Space / Energy / Oil&gas / Civil Engineering (large building structures)

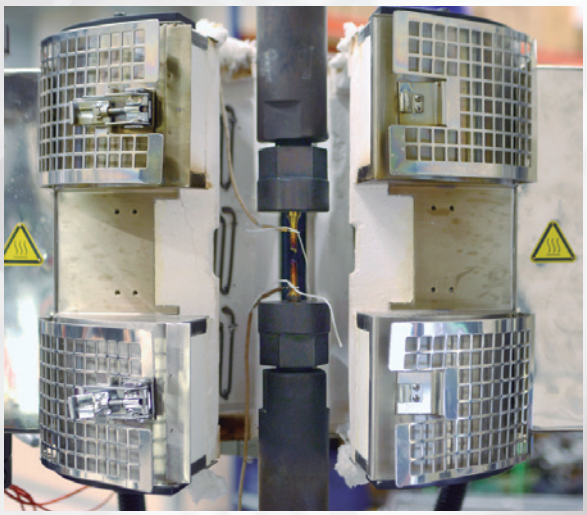
## Quality certifications, nuclear qualifications:

Nadcap Accreditation (Materials Testing, Non-metallic materials testing, nondestructive testing); ISO/IEC 17025 Accreditation (Materials testing, EMC testing, Environmental testing, Vibrations Testing, electrical safety testing, Fire Testing, Wireless communications testing, IT security evaluations, amongst others); EN 9100 Certificate (Structural Testing and Engineering), Aerospace & Defense Customer Approvals (Airbus, Boeing, Rolls-Royce, etc.)

Applus Mechanical Test Laboratory

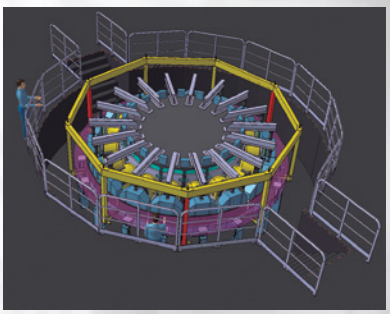


Applus Electromagnetic Compatibility Test Facility

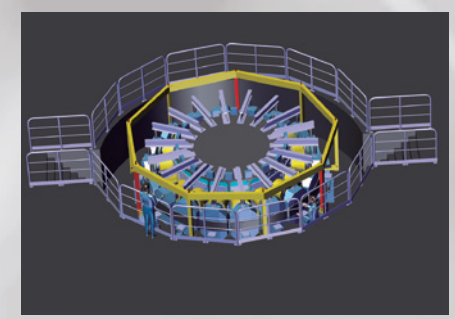


Applus Mechanical Test High Temperature Test Facility

ITER Project - Mechanical Tests on Intercoil Structures at cryogenic temperatures



Project ITER pre-compression Rings Test Facility



Project ITER pre-compression Rings Test Facility 2

| | |
|---|---|
| **COMPANY NAME** | **ARRAELA SL** |
| **ADDRESS** | **Rúa Peteiro, Parcela M-3, Polígono de Vilar do Colo, 15621 Cabanas (A Coruña), Spain** |
| **WEB** | **www.arraela.com** |
| **TURNOVER** | **953,617.40€ in year 2015** |
| **EMPLOYEES** | **7.52 in year 2015** |
| **CONTACT PERSON** | **Juan Manuel Caruncho Rodado** |
| | **POSITION CEO** |
| | **PHONE +34 629 042 662** |
| | **EMAIL jmcr@arraela.com** |
| | **SME Yes** |

**Company activities and skills:**

The company Arraela S.L. is mainly engaged in materials research. Our studies focus on different fields of study, however the company specializes in the development and manufacture of nuclear shielding. Other areas of work are materials for thermal energy storage, marine concrete and polyvalent electromagnetic shielding concrete.

**Large scientific facilities and national research facilities contracts:**

- Hospital Mateu Orfila (Menorca) (currently). Concrete vault for Radiotherapy. (2017)
- LASER PET (Universidad de Santiago de Compostela). Manufacture and delivery for mobile radiological shielding (2016).
- Hospital de la Ribera (Alzira). Brachytherapy facility, TAC room, doors. 2016.
- Centro de Láseres Pulsados (Salamanca). Concrete walls, doors and beam dumpers for radiological protection (2015-2016)
- Hospital de Coimbra (Portugal). Brachytherapy vault with concrete bricks (2015)
- CIEMAT (Madrid) - Neutron shielding door for "Neutron Pattern Laboratory for CIEMAT" (2012)
- ALBA SYNCHOTRON (Barcelona) - LINACS plug's and hutches guillotines (2011)
- ALBA SYNCHROTRON (Barcelona) - 2 hutches in lead for ALBA storage rings at CELLS. These two hutches corresponds to Optical station and Experimental Station, and a hoist with 1000 kg of capacity. Hutches were self-supporting structures. (2011)
- Instituto Catalán de Paleontología (Sabadell): a door and a vault for an industrial tomography machine (2011).
- ITN (Portugal). Vault and door for neutron radiation (2010)

More than 50 concrete vaults and doors for hospitals and research centers in Spain and Portugal (also 1 radiotherapy facility in Panamá).

**R&D projects:**

- 2016-2018: "Development of New Technologies for Radiological Protection Against Radon" (FEDER FUND)

• 2011-2012: “New Materials for Radiological Protection” (Xunta de Galicia)

**Markets:**

Nuclear / Defense / Naval / Energy

| | |
|---|---|
| **COMPANY NAME** | **ASTURFEITO** |
| **ADDRESS** | **Pol. Ind. Tabaza B9, 33438 Carreño (Asturias), Spain** |
| **WEB** | **www.asturfeito.com** |
| **TURNOVER** | **36 M€ in year 2015** |
| **EMPLOYEES** | **230 in year 2016** |
| **CONTACT PERSON** | **Ricardo Rodríguez** |
| | **POSITION Corporate Sales Manager** |
| | **PHONE +34 985 514 024** |
| | **EMAIL rrodriguez@asturfeito.com** |
| | **SME Yes** |

**Company activities and skills:**

ASTURFEITO is a Spanish industrial group located in Asturias, we are specialised in the fabrication of capital goods and components for the most important organizations worldwide.

Asturfeito has a wide experiencie in the supply of mechanical components for the top scientific installations all around the world.

Our facilities located in the Port of Aviles, allow us to deal with large and complex projects, offering an experienced Project Management team and mechanical engineering services.

In our shops we deal with specialized welding of different materials. In addition we offer in-house precision machining of large pieces, and we can perform mechanical, electrical and hydraulic assembly.

We have a highly skilled team, excellent technological capabilities and extensive facilities to meet the requirements of the most demanding clients in Scientific Facilities Sector

**Large scientific facilities and national research facilities contracts:**

1. ASTURFEITO is supplying LSST project Telescope Mount Assembly (2014).

The scope of supply includes manufacturing engineering, structure welding and machining, mechanical assembly, electrical assembly, hydraulic assembly.

The project team will carry out shop and site assembly.

2. ASTURFEITO is supplying for CIEMAT/JAEA (2014) the CRYOSTAT BODY for JT-60SA Tokamak Project.

This large Stainles Steel structure of about 300tons has been welded and machined in 12 pieces and then final assembly is to be done in our workshop, to meet the high precision requirements of the customer.

3. ASTURFEITO supplied to IDESA (2012) the machining, final mechanical assembly and dimensional control with laser tracker of the CRYOSTAT BASE for JT-60SA Tokamak Project.

This large Stainles Steel structure of about 300tons has been machined in seven pieces and then assembled in our workshop, to meet the high precision requirements of the customer.

4. ASTURFEITO was responsible for the supply of 25 radiotelescopes for ALMA project (2012-ESO) and was in charge of:

- Supply of raw material
- Manufacturing engineering & Welding procedures
- Welding, machining and painting
- Mechanical, electrical and hydraulic assembly
- Verification and functional tests
- Packing and transportation

5. Engineering and manufacturing of Gel Rack Support Futs for Heavy Water Containers (ILL-2012)

6. ASTURFEITO has been involved in the construction of GRANTECAN in La Palma, Spain (2009)

-Manufacturing of side extensions of DEL EMTCS Vacuum Vessel

-Manufacturing of Supports for Osiris Imaging System

7. ASTURFEITO has participated in the construction of the LHC (Large Hadron Collider), the biggest particle accelerator in the world to CERN (2009), the European Organization For Nuclear Research, is one of the world's largest and most respected centres for scientific research. Its business is fundamental physics, finding out what the Universe is made of and how it works

8. ASTURFEITO has collaborated with ILL manufacturing support detectors for the High Flux Reactor The Megajoule Laser (2009), which will make it possible to study the nuclear stage of weapon operation, is currently under construction at the CEA Cesta site (Bordeaux).

9. ASTURFEITO has collaborated with ESRF manufacturing parts for mirror assembly and components for beamline ID 16 (2010). The European Synchrotron Radiation Facility is a joint research facility supported by 19 countries that operates the most powerful synchrotron radiation source in Europe, and is generally considered to be a world leading research facility.

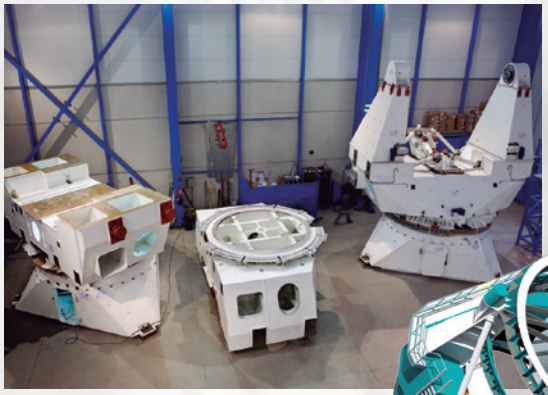
10. ASTURFEITO has supplied main 750Tons crane girders for ITER project (2015) for the package managed by REEL.

**Markets:**

Nuclear / Defense / Naval / Aeronautics / Space / Energy / Oil&gas / Astronomy

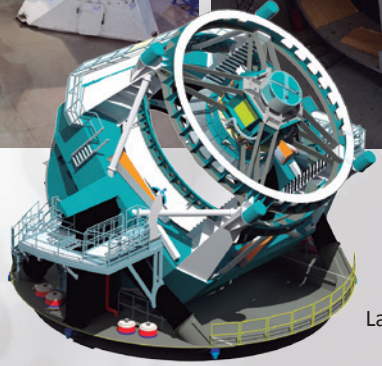
**Quality certifications, nuclear qualifications:**

ASME / ISO 9001 / ISO 14001 / ISO 1090-ISO 3834/2



ALMA Project Antennas

J-60 Cryostat Base



Large Synoptic Survey Telescope

| | |
|---|---|
| **COMPANY NAME** | **AVS Added Value Industrial Engineering Solution S.L.U.** |
| **ADDRESS** | **Polígono Industrial Sigma, C/ Xixilion 2 bajo, pab. 10; 20870 Elgoibar, Gipuzkoa, Spain** |
| **WEB** | **www.a-v-s.es** |
| **TURNOVER** | **4,593,969€ in year 2016** |
| **EMPLOYEES** | **36 in year 2016** |
| **CONTACT PERSON** | **Miguel Ángel Carrera** |
| | **POSITION CEO** |
| | **PHONE +34 943 821 841** |
| | **EMAIL macarrera@a-v-s.es** |
| | **SME Yes** |

### Company activities and skills:

AVS is an SME, which aims to provide technology-based products to innovative and challenging projects. Strongly focused on development of outstanding devices, instruments, mechanisms and structures, our expertise covers from design, manufacturing, assembly, tests and supply under ISO 9001 EN 9100, providing our customers all the way up from the conceptual design to the turnkey.

AVS skills on engineering design, mechatronic, diagnostics and instrumentation, high-precision positioning systems in UHV, high magnetic fields and cryogenics, micro-mechanisms, opto-mechanical systems and neutron detection, provided the path to successfully deliver projects in the fields of Particle Accelerators, Lasers, Nuclear Fusion, Astrophysics and Space.

### Large scientific facilities and national research facilities contracts:

COMPASS D Tokamak (IPP-CZ) slits and grids - 2017

ITER Ecrh-rf sensors - 2017

UFL Miradas probe arms - 2017

ESRF Design and manufacturing of a soft x-ray spectrometer - 2016

ESRF Delivery of 65 girders for esrf upgrade - 2016

JET/CNA Transimpedance amplifiers for ka-3 detectors - 2016

ITER Saddle loop Prototypes - 2016

ITER Out vessel magnetic sensors - 2016

ITER Inconel mirnov frames - 2016

ITER Magnetic sensor platforms - 2016

ITER Mechanical looms clamping systems & wiring - 2016

HZB Design and manuacturing of the neat spectrometer vacuum vessel 2015

CIEMAT/IFMIF Design and manufaturing of two sets of beam scrapers for the mebt - 2015

ESS BILBAO Design of the target drive unit for ESS - 2015

CLPU Design and manuacturing beam transport for the vega petawatt laser - 2015

UCM Megara spectrograph - 2015

CIEMAT/IFMIF High power ifmif slits - 2014

ILL Design and manufacture of the thales instrument - 2014

CERN Hie isolde intercryomodule diagnostics - 2014

UCM Megara mos - 2014

IAC Espresso fiber link - 2013

ESS BILBAO Design and manuacturing of extraction column for H+ ion source - 2012

CSIC Stokes polarimeter-bootes - 2012

**R&D projects:**

- Accelerators and related Technologies for Large Scale Scientific Facilities, CDTI 2016
- Beam Transport Opto-mechanical supports and alignment systems for LASER VEGA III, CDTI 2015
- Advanced Opto-mechanical Systems and Neutron simulations for Large Scale Scientific Facilities, CDTI 2014
- ATLAS' supports re-engineering design following ALARA, CDTI 2012
- A study of Spherical Focal planes for multi-object Spectroscopy analysis in Large Telescopes, CDTI 2010
- A compact Hexapod for UHV applications, CDTI 2010
- Beam Diagnostics and Control systems, CDTI 2010
- Manufacturing Technologies for High Intensity Superconducting LINACs focused on Samples Irradiation, CDTI 2010

**Markets:**

Nuclear / Space / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

ISO 9001 / EN 9100:9009

Optomechanics for a petawatt laser

Beam transport for a petawatt laser

| | |
|---|---|
| **COMPANY NAME** | **AWGE TECHNOLOGIES S.L.** |
| **ADDRESS** | **Avda. Castros s/n. CDTUC Fase A, P-209, Santander** |
| **WEB** | **www.awge.es** |
| **TURNOVER** | **4,264€ in year 2016** |
| **EMPLOYEES** | **5 in year 2016** |
| **CONTACT PERSON** | **Fernando Mirapeix** |
| | **POSITION Director of Engineering** |
| | **PHONE +34 942 136 719** |
| | **EMAIL fmirapeix@awge.es** |
| | **SME Yes** |

**Company activities and skills:**

AWGE Technologies is a provider for engineering and manufacturing services. From conceptual design to turn-key solutions, we cover all the areas in a transparent and flexible mode. Research, Design, Innovation, Manufacturing, Support & Consultancy and Test are among our skills. The ingredients for our recipes are RF&Microwave, Mechanics, Cryogenic Systems and Ultra High Vacuum. We add value especially where more than one of these technologies are present. Our engineering and manufacturing departments are really close doing possible to assure quality and delivery time. AWGE is known for the innovative solutions provided and the collaborative spirit with different firms, universities and technology centres.

Our prime customer segments are Science, Defence, Industry and Health.

**Large scientific facilities and national research facilities contracts:**

- (ESS) High vacuum seal for radioactive environment (2016)
- (ESS) Auto-levelling Beam Dump Shielding (for high neutron flux), 91Tm (2016)
- (ESS) Drafting and manufacturing engineering for the Monolith Vessel (2016)
- (ESS) Unmanned Ultra High Vacuum sealing for high neutron irradiated areas (2017)

**R&D projects:**

- 5 Axes&4K Cryogenic manipulator (high stability)
- (ESS) Low loss special waveguides (3MW)
- Proton beam diagnostics
- Detecting and killing asian hornet (Vespa Vetulina)
- Design of 30m3 LNG tanks

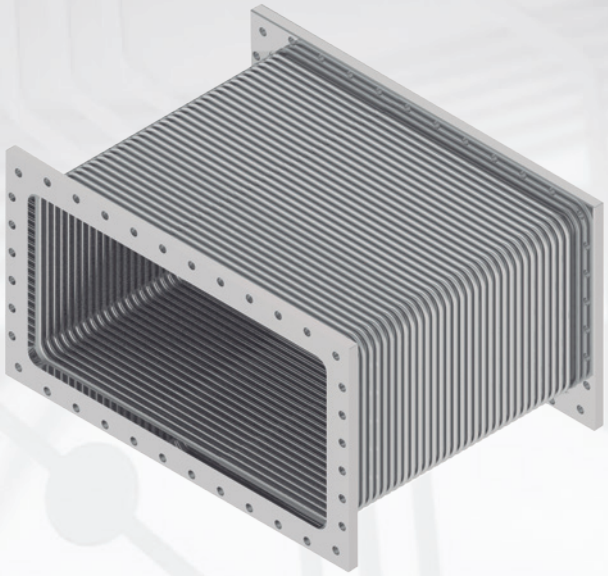
**Markets:**

Nuclear / Defense / Space / Other Science

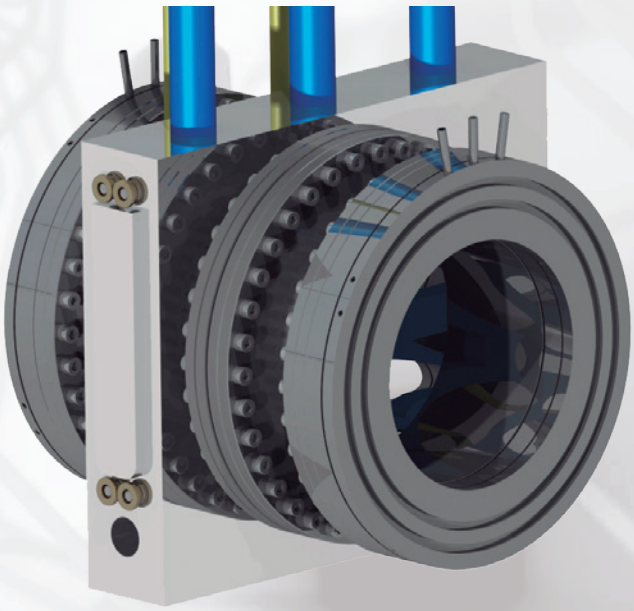
**Quality certifications, nuclear qualifications:**

ISO 9001

4K&5Axes cryogenic manipulator



Flexible and rigid waveguides (3MW peak)



Special High Vacumm Sealing solutions

| | |
|---|---|
| **COMPANY NAME** | **BROAD TELECOM, S.A. (BTESA)** |
| **ADDRESS** | **Margarita Salas, 22. Parque Leganes Tecnologico. 28918 - Leganes (Madrid). Spain** |
| **WEB** | **www.btesa.com** |
| **TURNOVER** | **15,2 M€ in year 2016** |
| **EMPLOYEES** | **73 in year 2016** |
| **CONTACT PERSON** | **Carlos Rosa** |
| | **POSITION Sales Manager** |
| | **PHONE +34 913 274 363. Ext.411** |
| | **EMAIL c.rosa@btesa.com** |
| | **SME Yes** |

### Company activities and skills:

BTESA is a leading technological group with long experience in the design, manufacturing and installation of radiofrequency equipment

The key of our successful record of RF equipment delivered all over the world is our powerful R&D department: 30% of BTESA staff, with specialization in all systems related with Solid state RF power amplifiers:

- Radiofrequency: experience for reliable transistor circuits
- Software: for internal logic control system and remote control
- Electrical: we design our own power supplies, with special care for surge protection
- Mechanical: careful cooling extends lifetime

The experience gained by our System Engineering department through the installation of RF equipment which should work 24/7 in the most extreme environments helped to improve the robustness and reliability of all our equipment, and built up the ability to integrate any RF power system, either with tube or with solid state technology.

The skill of the R&D team to design any RF product together with the flexibility of the System Engineering department to adapt to any project, allowed BTESA to easily jump into the Scientific applications.

### Large scientific facilities and national research facilities contracts:

- CERN: Manufacture and test of 180 Solid-State Power Radio Frequency (RF) Amplifiers 3kW @ 17MHz for the PS (Proton Synchrotron Accelerator). 2016
- CELLS (for ALBA light source): Design, manufacture, supply and installation of one 50kW RF high power transmitter based on Solid State Amplifiers @ 500MHz for the ALBA Booster synchrotron (SSA). 2016
- CELLS (for ALBA light source): Manufacture, supply and installation of sixteen (16) 80kW IOTs tubes at 499,654MHz and ten (10) trolleys with its auxiliaries for the ALBA Storage Ring RF transmitters. 2016
- UPM (for European XFEL): Manufacture and supply of 40 power supplies for the superconducting magnets of the European X-Ray Free Electron Laser. 2016

- CERN: Design and manufacture of 11 drivers 1200W @ 704MHz pulsed Solid State RF Amplifiers for the MB-IOT test bench system for ESS. 2016
- CERN: Design and manufacture of 5 drivers 1000W @ 750MHz pulsed Solid State RF Amplifiers for the Medical RFQ. 2016
- CELLS (for ALBA light source): Design and manufacture of 600W driver @ 500MHz. 2016
- UPM (for European XFEL): Manufacture and supply of 250 power supplies for the superconducting magnets of the European X-Ray Free Electron Laser. 2015
- CELLS (for ALBA light source): Manufacture, supply and installation of 1 prototype and a series of 4 units of 80kW IOT tubes at 499,654MHz, with all their accessories, for the storage ring RF transmitters of ALBA synchrotron Light Source. 2014
- SEDECAL (for AMIT project): Design and manufacture of 8kW SSPA, at 60-75MHz for the compact superconducting cyclotron of the AMIT (Advanced Molecular Imaging Technologies) project. 2014
- CIEMAT (for IFMIF/EVEDA): Design, Manufacturing and supply of 2x16kW RF Solid State Power amplifiers at 175 MHz, for the Buncher cavities of the MEBT of the IFMIF/EVEDA Accelerator Prototype (LIPAc), presently under construction in Rokkasho (Japan). 2013

**R&D projects:**

ACTECA: 'ACCELERATORS AND RELATED TECHNOLOGIES FOR LARGE SCIENTIFIC FACILITIES", Industrial R&D CDTI funded project, awarded in a consortium of 7 companies within the CIEN funding program

**Markets:**

Other Science: Telecom & Broadcast

**Quality certifications, nuclear qualifications:**

ISO 9001


Hot-plug liquid-cooled module 2kW

16kW cw SSPA for IFMIF-EVEDA

| | |
|---|---|
| **COMPANY NAME** | **CADINOX SA** |
| **ADDRESS** | **Okobio 32, 20491 Belauntza, Gipuzkoa** |
| **WEB** | **www.cadinox.com** |
| **TURNOVER** | **10,500,000 € In year 2016** |
| **EMPLOYEES** | **64 in year 2016** |
| **CONTACT PERSON** | **Peio Lakarta** |
| | **POSITION Commercial Director** |
| | **PHONE +34 618 329 793** |
| | **EMAIL plakarta@cadinox.com** |
| | **SME Yes** |

**Company activities and skills:**

CADINOX, since 1966 is specialized in the detail design, fabrication, testing, assembly and machining of integral mechano-welded products. Cadinox has a large experience manufacturing in complex Stainless steels, Carbon Steels and Aluminium.

Cadinox has many references in Vacuum Chambers ( high vacuum) Cryostat and large and complex structures.

**Large scientific facilities and national research facilities contracts:**

- CIEMAT: IFMIF BEAM DUMP CONE, 2017
- CERN: CRYOSTAT 11T PROTOTYPE, 2017
- ELI: LASER EXPERIMENTAL CHAMBER, 2017
- CLPU: LASER COMPRESSOR AND EXPERIMENTAL CHAMBER, 2015 & 2016
- CERN : HIE-SOLDE CRYOMODULES, 2013 & 2015
- CERN: DTL TANK AND GIRDER, 2014
- CERN: NA 62 RICH VESSEL, 2014
- CERN: NA 62 STRAW STATIONS, 2014
- ESRF: SMALL ANGLE SC ATTERING BEAMLINE (SAXS), 2014
- HZB: NEAT DETECTION CHAMBER, 2014
- ESS: DTL TANK, 2014
- ILL: IN16B VACUUM CHAMBER, 2011
- ILL: IN16B DEFLECTOR CHAMBER, 2011
- GRANTECAN: NASMYTH ROTATORS HIGH PRECISION, 2005

**Markets:**

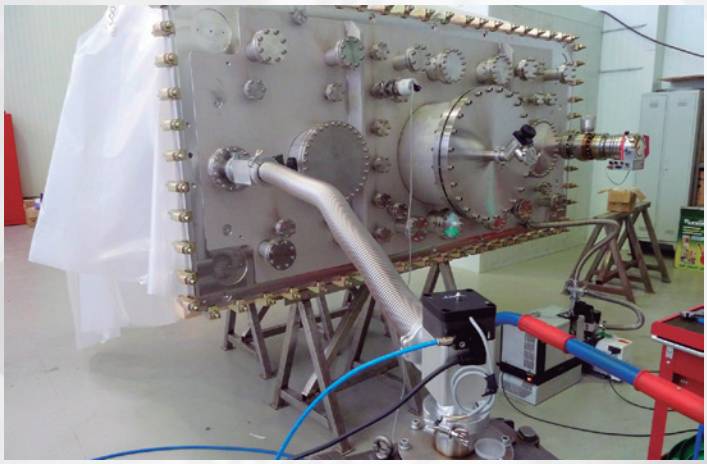
Nuclear / Aeronautics / Space / Energy / Oil & gas

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 3834-2

CERN detector chamber

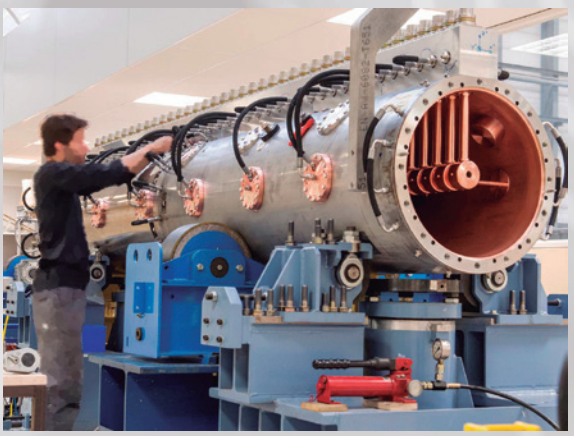
CERN rich vessel NA62



CERN vacuum for hie-solde

CERN vacuum for hie-solde2

CLPU HV vacuum chamber



CERN dtl tank

| | |
|---|---|
| **COMPANY NAME** | **CEIT-IK4** |
| **ADDRESS** | **Paseo Manuel Lardizábal 15, 20018 Donostia-San Sebastian, Spain** |
| **WEB** | **www.ceit.es** |
| **TURNOVER** | **16 M€ in year 2016** |
| **EMPLOYEES** | **254 in year 2016** |
| **CONTACT PERSON** | **Erik Fernández** |
| | **POSITION Corporate Development Manager** |
| | **PHONE +34 943 212 800 (EXT. 2238)** |
| | **EMAIL efernandez@ceit.es** |
| | **SME No (Non-profit Research Centre)** |

### Company activities and skills:

CEIT is a nonprofit private research center, co-founder of the IK4 Research Alliance, with the mission to serve the industrial sector, carrying out projects of applied research and technological development. CEIT is a multidisciplinary center, whose work is oriented to different sectors: railway, aeronautical, automotive, health, manufacturing, energy, environment and ICT.

CEIT's capabilities and interests with regard to large sciencific facilities are:

- Development of materials and components for extreme environments: graphitic materials, self-passivating W alloys, ODS Steels.

- Design, production and processing of powders. Equipped with metal/gas atomizer to produce tailored metallic powders for Additive Manufacturing or (Near) Net Shape Technologies

- HIP. Consolidation of ceramic and metallic powders, removal of porosity in castings or components obtained by Additive Manufacturing

- Laser-related technologies: additive manufacturing of components and surface treatments and micromachining

- Solid state diffusion bonding. Equipped with and HIP press.

- Failure analysis: identification of failure mechanisms (mechanical and thermomechanical fatigue, corrosion, fractography analysis…)

- Electronic and magnetic NDT for microstructural characterization and identification of defects and cracks

- Physical, Mechanical and microstructural characterization (SEM, TEM, AFM)

### R&D projets

Self-passivating tungsten alloys. EUROfusion (Euratom grant agreement No 633053). Development of tungsten alloys as armour material of DEMO, with very low oxidation rate at high temperatures, in accident-like conditions (1000 ºC). Selection of best alloying elements and design of the manufacturing route to minimize tungsten oxidation and develop a dense and stable oxide layer at the surface. 2014-2018.

ODS ferritic steels as structural materials for DEMO. EUROfusion (Euratom grant agreement No 633053). Development of a new route to obtain oxide dispersion strengthened ferritic steels with high strength and creep resistance up to 750 ºC and good resistance to neutron irradiation damage. 2014-2018.

F4E-OFC-618. Material Characterization at room and elevated temperatures. ITER, subcontracted by Tecnalia. Ceit's task: Thermal conductivity and thermal expansion measurements, and microstructural characterization by TEM of materials of ITER components. 2016-2018.

F4E-OPE-443 (IV-DT): Supply of Full Scale Prototypes (FSP) of ITER Normal Heat Flux (NHF) FW Panels. ITER, subcontracted by Leading Metalmechanic Solutions. Ceit's task: Conditioning of surfaces (chemical cleaning) to be joined by HIP diffusion bonding; microstructural and mechanical characterization of materials. 2015-2017.

Fusion Technologies. CDTI, Subcontracted by HEDISA and Leading Metalmechanic Solutions Ceit's task: Solid state diffusion bonding of titanium and titanium alloys. Development of complex stainless steel components following (Near) Net Shape technology, by powder metallurgy and HIP consolidation of powders. 2016-2017.

Assessment of the candidate tungsten bricks of the ESS target suppliers according to the tests protocol provided by ESS-Bilbo. ESS-Bilbao. Ceit's task: selection of the tungsten bricks supplier intended for the target of the European Neutron Spallation Source (ESS), following a testing protocol developed by Ceit that included analysis of chemical composition, determination of porosity, microstructural characterization, mechanical testing and residual stresses measurement. 2015-2017.

CompITER. Government of Cantabria, subcontracted by Leading Metalmechanic Solutions. Ceit's task: Development of a simplified 10-fingers prototype to design proper cutting strategies of the fingers of the FWP of ITER to mitigate distortions in the final component. 2015-2016.

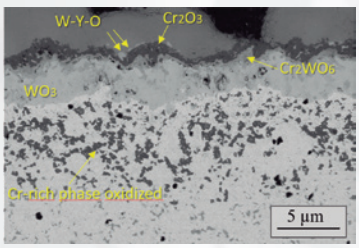
F4E-OPE-394 (IV-PT): Fabrication of a standard semi-prototype of the ITER NHF First Wall Panels (FWP). ITER, subcontracted by Leading Metalmechanic Solutions. Ceit's task: Conditioning of surfaces (chemical cleaning) to be joined by HIP diffusion bonding. 2013-2014

F4E-OFC-167: Material Characterization at room and elevated temperatures. ITER, subcontracted by Tecnalia. Ceit's task: thermal conductivity measurements and microstructural characterization by TEM of materials employed in ITER. 2012-2014.

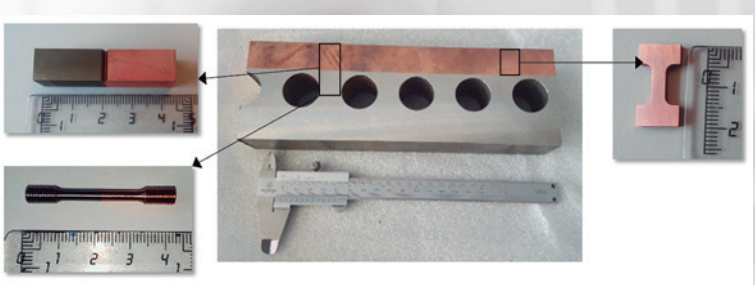
ITER Blankets. CDTI (Spain), subcontracted by Leading Metalmechanic Solutions. Ceit's task: diffusion bonding of Be and CuCrZr by HIP, and microstructural characterization to evaluate quality of joints. 2012-2013.

**Markets:**

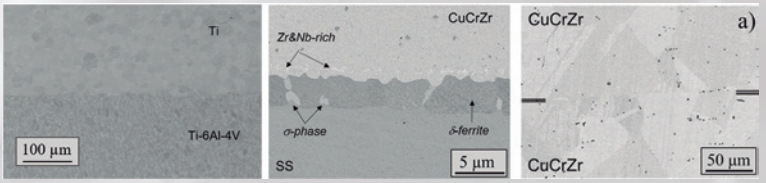
**Quality certifications, nuclear qualifications:**




Cross section of W-10Cr-0.5Y alloy after oxidation at 1000 ºC during 24 h.



Segment of a CuCrZr/316L stainless steel component obtained by HIP diffusion bonding, and test samples




SEM images of different diffusion bonded joints.


**COMPANY NAME** CELIS (CELESTIA INGENIERÍA DE SISTEMAS)
**ADDRESS** Isla del Hierro, 7 - Oficina 3.1
28703 San Sebastián de los Reyes (Madrid), Spain
**WEB** www.cel-is.com
**TURNOVER** 1.3 M€ in year 2015
**EMPLOYEES** 10 in year 2015
**CONTACT PERSON** María de la Palma García Hernández
**POSITION** Business Development
**PHONE** +34 606 115 841
**EMAIL** mpgarcia@cel-is.com
**SME** Yes

## Company activities and skills:

CELIS (CELESTIA Ingeniería de Sistemas) is a Spanish private SME company dedicated to providing Innovative and Customized Satellite Ground Segment Solutions, Products and Services.

CELIS started its operations in September 2014 as a company of CELESTIA Technologies Group and with industrial managers of recognized experience in the space market as shareholders. Thanks to the solid experience and large heritage of our staff, we are able to provide custom solutions, as well as to develop products to satisfy the space and defense market demands. CELIS combines the flexibility and autonomy of a small company with the support from CELESTIA Technologies Group.

Our solutions cover the ultimate features and functionalities for the complete satisfaction of our clients in a wide range of applications, such as; Telecommunications, Navigation, Earth Observation and Space Surveillance. The main business lines of CELIS are:

- Ground Segment: System Engineering, Ground Stations and Equipment, Monitoring & Control, Test Benches, Carrier Monitoring, Assembly Integration and Testing (AIT) activities, Integrated Logistics Support (ILS).
- Embedded Software and Development: Equipment Firmware, Monitoring & Control, In-Orbit Test Software, Carrier Monitoring Software, Orbital Analysis, Ad-hoc Firmware and Software development.
- Galileo Engineering & Services: Galileo Ground Equipment, Galileo Remote Elements, Galileo Software, Remotes Sites related activities, Operation Support and ILS activities.
- Space Surveillance and Tracking: System Engineering and Sensors: System Engineering, Orbital Analysis Tool, Radar Sensors, Monitoring & Control, AIT and ILS activities.

CELIS skills applicable to Astronomy are:

- Electronic and Mechanical Tracking Systems.
- Monitoring & Control Systems.
- Test Benches.

## Large scientific facilities and national research facilities contracts:

**[EUMETSAT] IOT Bench for the EPS-SG TT&C System (2016)**

In the frame of EPS-SG Mission Control System (MCO) program CELIS, being part of the consortium led by GMV, was awarded with the subcontract for the delivery of the In-Orbit Test Bench for the TT&C Station to be deployed in Svalbard in order to provide service to EPS Metop-SG and NOOA JPSS satellites.

The bidding phase started at the end of 2015 and the contract was signed mid 2016. Currently, the system is under Preliminary Design Review (PDR) to be completed by July 2017. Delivery of IOT Bench is envisaged for October 2018. Support, Warranty and Maintenance Services will be provided up to the end of the whole program by mid 2023.

In-Orbit Test Bench produced by CELIS will perform commissioning and routine satellite testing for the whole mission.

**[ESA] Spanish Space Surveillance and Tracking System S3T System Development - Phase 1B (2015)**

As part of the Spanish Space Surveillance and Tracking (S3T) System Development Program, CELIS was awarded, as leader of the consortium, with a contract for the Design and Prototyping of the Space Surveillance Radar (S3TSR) intended to cover the LEO region.

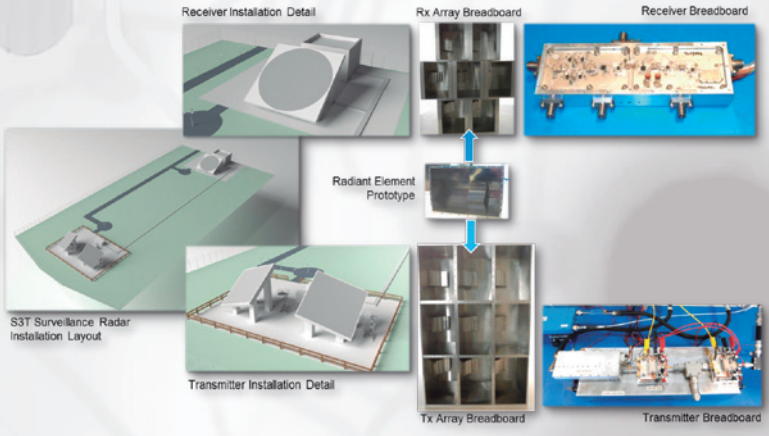
The bidding phase and contract signature was performed in 2015 and the contract had a duration of 6 months ending at February 2016. The design of the final S3T Surveillance Radar, as well as of a downscaled version was performed. In addition, breadboarding of main building blocks was performed for technology demonstration and confirmation of design hypothesis.

**Markets:**

Defense / Space

**Quality certifications, nuclear qualifications:**

ISO 9001




[ESA] Design and Bread-boarding activities for S3T Surveillance Radar

CELIS IOT Bench Solution

cen SOLUTIONS
Smart Energy Solutions

| | |
|---|---|
| **COMPANY NAME** | **CEN SOLUTIONS** |
| **ADDRESS** | **Carretera de la Esclusa, s/n 41011 Sevilla** |
| **WEB** | **www.censolutions.es** |
| **TURNOVER** | **10.13 M€ in year 2015** |
| **EMPLOYEES** | **145 in year 2016** |
| **CONTACT PERSON** | **Juan Pérez-Tinao Domínguez** |
| | **POSITION Business Development – International Markets** |
| | **PHONE +34 954 936 210** |
| | **EMAIL juan.pereztinao@censolutions.es** |
| | **SME No** |

**Company activities and skills:**

CEN Solutions has a long experience of more than 75 years in the provision of services to the electrical industrial market, focusing on design, development and implementation of al kind of electrical switchboards and electromechanical applications.

Company activities are focused focused on the following main markets:

- Fossil fuel generation
- Nuclear power generation
- Renewable generation
- Oil & Gas
- Industries and electrical substations
- Airports and Railway
- Water treatment plants
- Maritime sector

CEN Solutions has expanded in 2016 its engineering and manufacturing capabilities, having now a highly skilled and experienced team of 150 people with experience in the supply of equipment for international customers worldwide.

Company products involve low voltage and medium voltage equipment, both for power and control applications.

CEN Solutions participation and knowledge on nuclear projects has more than 40 years experience, with safety and non-safety equipment installed on nuclear power plants in Spain, Mexico, China and Taiwan.

For the proper project development we have a dedicated project management, who is supported with mechanical and electrical engineering offices that can provide bespoke solutions in accordance with project and customer requirements.

Two production centers are located in Sevilla with a total area rated 16.000m$^2$, and located strategically in free trade zone to facilitate international operations.

**Large scientific facilities and national research facilities contracts:**

Iter Project – Support on design and manufacturing processes for SCS-N qualification cubicles (2016)

CEN Solutions has initiated its participation on ITER project by supporting the design and manufacturing processes on the qualification cubicles for SCS-N package.

Works performed involve the participation with ITER Organization project team and SCS-N contractors to support the adequate definition of the qualification cubicles for seismic qualification, elaboration of the associated procedures, manufacturing of the cubicles, performance of the tests, and evaluation of the results.

[CERN] – DC Power Supply 0-5.400A, 1.800V (1993)

[CERN] - DC Power supply 0-20.000A, 17V (1991)

[CERN] – 2 DC Power supply 0-24.000A, 17V (1991)

[CERN] – DC commuted Power supply -10 --> +10V, -2.000 --> +2.000A (1991)

[CERN] – DC Power supply 0-20.000A, 25V (1990)

[CERN] – 40 AC Voltage Regulator 0-1.000A, 1.500kW (1987)

Collaboration with CERN started in the first stages of LHC, by the participation of the team with stances at site to work together during engineering phase prior starting manufacturing processes at our production center in Seville.

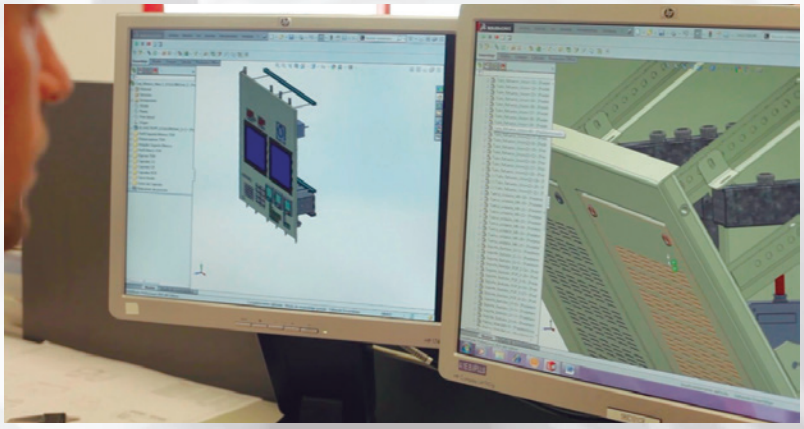
**Markets:**

Nuclear / Defense / Naval / Aeronautics / Energy / Oil&gas

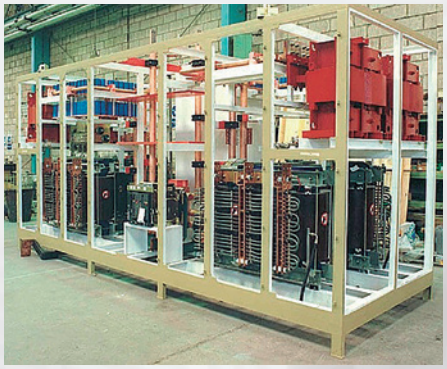
**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

SCS-N Qualification Cubicle



Mechanical engineering



DC Power Supply for CERN2

Sevilla Production Center

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|---|---|
| **COMPANY NAME** | **CESA (COMPAÑÍA ESPAÑOLA DE SISTEMAS AERONÁUTICOS S.A)** |
| **ADDRESS** | **Paseo John Lennon 4, 28906 Getafe (Madrid)-Spain** |
| **WEB** | **www.cesa.aero** |
| **TURNOVER** | **94,3 M€ in year 2016** |
| **EMPLOYEES** | **341 in year 2016** |
| **CONTACT PERSON** | **Eduardo Chamorro** |
| | **POSITION Technical and Commercial Director** |
| | **PHONE +34 916 240 105** |
| | **EMAIL contactcesa@cesa.aero** |
| | **SME No** |

### Company activities and skills:

CESA is a European company that competes in the field of fluid-mechanical equipment. Its main activities include:

- Design, manufacturing, qualification and product support of mechanical equipment and aerospace/aeronautical applications.
- Development and production.
- Maintenance and product support.

CESA has proven experience in the fluid mechanics equipment sector and in electromechanical actuation with resolution in the range of the nanometres for active stabilisation subsystems of primary segmented telescope mirrors.

### Large scientific facilities and national research facilities contracts:

CESA in the mechanical design of segment subunits has been awarded the following contracts in the Astronomy field:

- [GTC] Design and Fabrication of positioners for the Primary Mirror for the Gran Telescopio de Canarias. (2000)
- [GTC] Design and Fabrication of Segment Subsystem for the Primary Mirror of Gran Telescopio de Canarias (2000)
- [ESO] Design and Fabrication of Prototype Segment for the Primary Mirror of the European Extremely Large Telescope (E-ELT) (2009)
- [ESO] Manufacturing and Delivery of Prototype Position Actuators for the Primary Mirror of the European Extremely Large Telescope (2009)
- [ESO] Design, Manufacture, Verification and Delivery of Qualification Models of M1 Segment Support, Fixed Frame assembly and Auxiliary Equipment for the European Extremely Large Telescope (E-ELT) (2015)

### R&D projets

[CDTI] Research and innovative concepts of segment support and positioners for the E-ELT (2009)

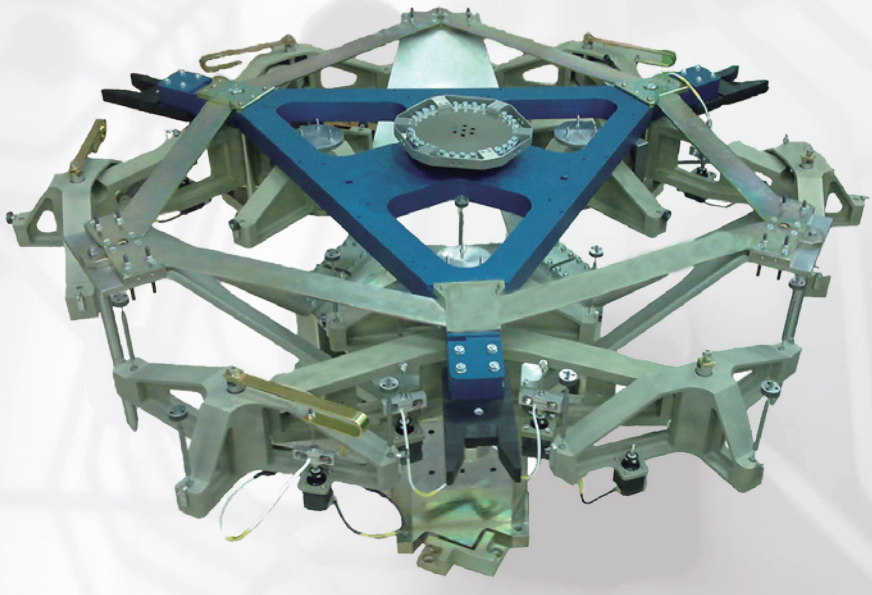
**Markets:**

Aeronautics

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, AS/EN 9100: 2010, AQAP / PECAL 2110, AQAP /PECAL 2310, EASA Part 145, EASA Part 21 G, FAR 145, PRI NADCAP

M1 Positioner Actuator



M1 Support System

| | |
|---|---|
| **COMPANY NAME** | **CITD ENGINEERING & TECHNOLOGIES, S.L.** |
| **ADDRESS** | **Avda. Leonardo da Vinci, 15. Edificio B, 2ª planta. 28906 Getafe (Madrid). Spain** |
| **WEB** | **www.citd.eu** |
| **TURNOVER** | **2,262,421 € in year 2016** |
| **EMPLOYEES** | **51 in year 2016** |
| **CONTACT PERSON** | **G. Héctor Lacasta Gonzalo** |
| | **POSITION Head of Industry and Energy Business Unit** |
| | **PHONE +34 655 718 697** |
| | **EMAIL hector.lacasta@citd.eu** |
| | **SME Yes** |

**Company activities and skills:**

CITD, the former ITD, is a company headquartered in Getafe close to Madrid. Its expertise is largely related to aerospace programs, being one of the leading engineering companies in the Spanish industry. This expertise embraces most of the engineering and design technologies also applicable for the development of Large Scientific Facilities Activities.

As an engineering company, with a core business in Electrical & Mechanical Systems, Structural Design & Analysis, and Instrumentation, our added value is based on our transnational management capabilities and our long experience in the development of international projects in highly technological environments.

CITD brings its best value to customers and partners in terms of innovative solutions, cost efficiency and quality assurance.

**Large scientific facilities and national research facilities contracts:**

CERN: "Provision of Mechanical Design Services On and Off the CERN Site" (2013-2019)

Under this framework contract a large collection of work packages involving design activities (3D and 2D) have been performed. The most relevant references are recorded here below:

- Dipole, quadrupole and skew quadrupole magnets for ELENA ring (CITD premises)
- Support structure for beam stopper on LINAC4 accelerator (CITD premises)
- LHC Interconnections (CITD premises/on site)
- PSB KFA Kicker Magnet update (CITD premises)
- Cold Cathode Assembly (CITD premises)
- Vertical and horizontal gonios (CITD premises)

Fusion for Energy: "Competitive Multiple Framework Service Contract: Provision of CAD Design Support – LOT 1 – General Mechanical Design" (2013-2016)

Under this framework contract, two specific Task Orders have been carried out:

- ITER Vacuum Vessel 3D design for manufacturing: final definition of Digital Mock-up incorporating improvements for manufacturing (CITD premises)
- NHF FW Panels detailed design of main and minor variants: Suitability analysis according

to ITER-blanket thermal and mechanical requirements. Digital mock-up and drawings (On site)

Fusion for Energy: “Industrial Cost Evaluation and Scheduling of the Cooling Plant for PRIMA (MITICA and SPIDER Experiments)” (2010)

PRIMA is a test facility facility located in Padova (Italy) aiming to test and qualify a full scale Heating and Current Drive Neutral Beam Injector before its installation at ITER.

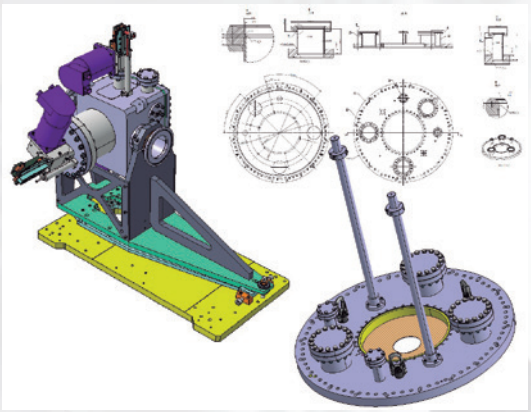
The scope of the contract was to set the requirements for the design, manufacture, installation and testing of the Cooling Plant. (CITD premises)

**Markets:**

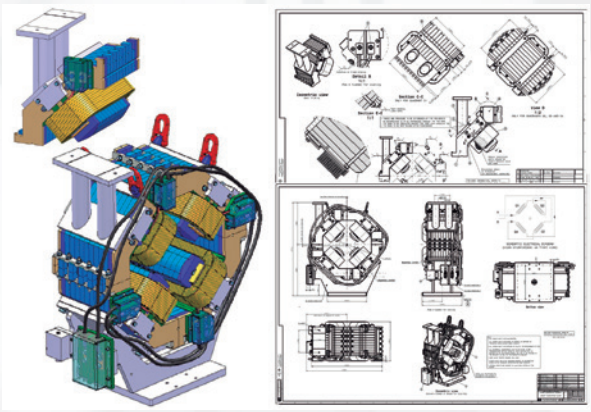
Nuclear / Defense / Naval / Aeronautics / Space / Other: Mechanical Engineering

**Quality certifications, nuclear qualifications:**

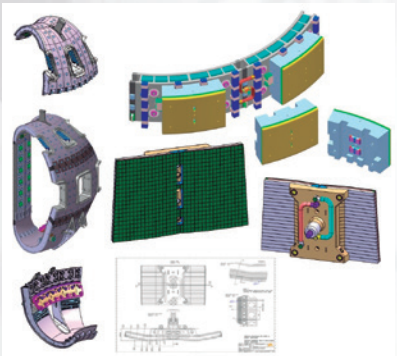
ISO 9001, EN 9100



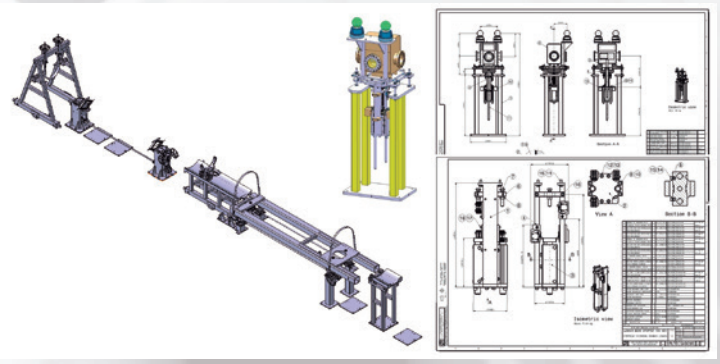
Cold Cathode & Gonio



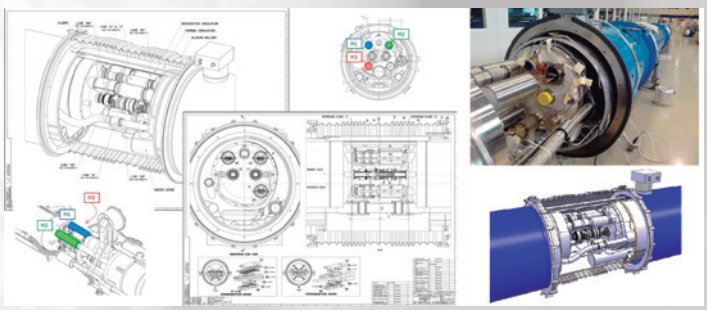
Quadrupole for ELENA ring



ITER Vacuum Vessel & FW blankets



Cryostat & Beam stopper support



LHC interconnections

| | |
|---|---|
| **COMPANY NAME** | **COMET INGENIERÍA** |
| **ADDRESS** | **C/ Convento Carmelitas 2, of.2, 46010 Valencia (Spain)** |
| **WEB** | **www.comet-ingenieria.es** |
| **TURNOVER** | **950 k€ in year 2016** |
| **EMPLOYEES** | **22 in year 2016** |
| **CONTACT PERSON** | **M. Ángel Sierra Hernández** |
| | **POSITION Business Development Manager** |
| | **PHONE +34 963 409 850 / +34 660 470 440** |
| | **EMAIL asierra@comet-ingenieria.es** |
| | **SME Yes** |

**Company activities and skills:**

Design of mechanical componets, structures, machines and tooling.

Structural analysis: static, dynamic, kinematic, thermal, fatigue, CFD, vibro-acoustic, etc.

Prototypes, test engineering support.

**Large scientific facilities and national research facilities contracts:**

ESA - 4000116156/15/NL/PS: Modular Deployable Structures - 2016

500 K€. Development of a reliable deployable unit cell that can be used to compose several kind of space structures, i.e., a large deployable mast (20 meters) and a large deployable reflector (15 meters diameter). Expected final TRL achieved: 4

ESA - 4000114438/15/NL/CBi/GM: Passive Damped Deployment of full Composite Structures – 2015

50 K€. Research and development of the use of flexible epoxi resins in order to deploy full CFRP structures. These structures are composed of thin-walled composite deployable booms with CFRP tape-spring hinges. This flexible epoxy resin can be used to increase both the flexibility and damping characteristics of the CFRP, and has a potential number of space applications. Final TRL achieved: 3

ESA - A00011082: Assembly of Space CFRP structures with racing sailing boats technology – 2011

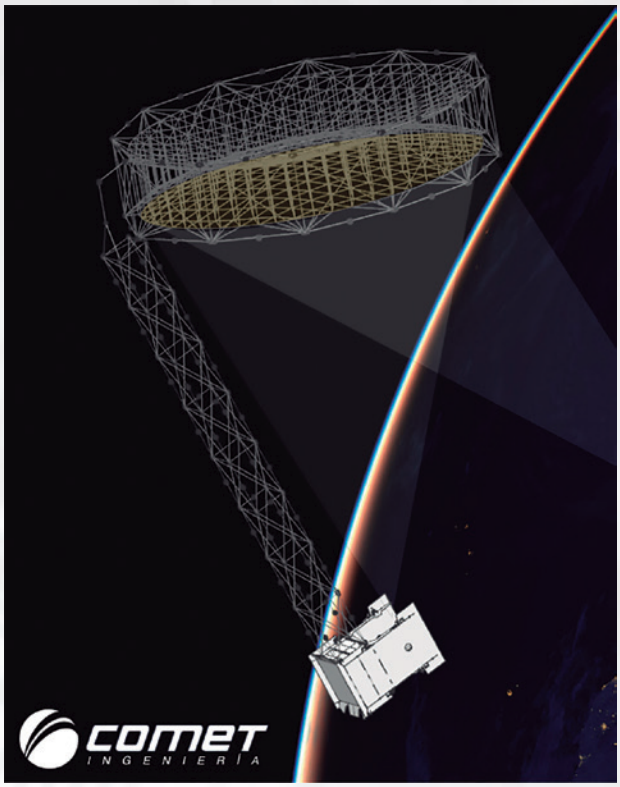
50 K€. Innovative project devoted to apply the out-of-autoclave CFRP curing techniques coming from the racing sailing boats technologies to space composite products, by means of analyses and tests. Final TRL achieved: 4.

**Markets:**

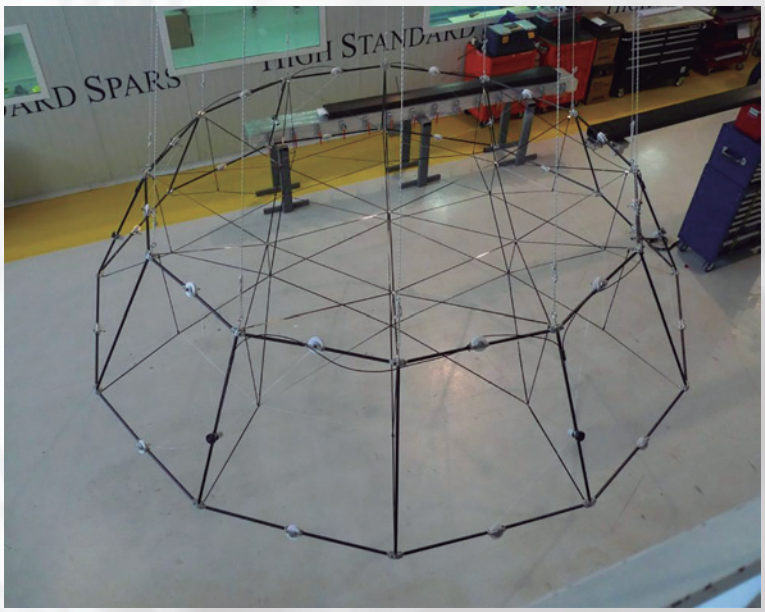
Defense / Automotive / Naval / Aeronautics / Space

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 9100




Large Deployable Antenna



Deployable Reflector Structure Demonstrator

AIRBUS

| | |
|---|---|
| **COMPANY NAME** | **CRISA** |
| **ADDRESS** | **Calle Torres Quevedo, 9 (PTM) 28760 Tres Cantos, Madrid - Spain** |
| **WEB** | **www.crisa.es** |
| **TURNOVER** | **55,6 M€ in year 2016** |
| **EMPLOYEES** | **437 in year 2016** |
| **CONTACT PERSON** | **Juan Jesús Rico Peña** |
| | **POSITION Key Account Manager** |
| | **PHONE +34 918 068 808** |
| | **EMAIL JuanJesus.Rico@airbus.com** |
| | **SME No** |

### Company activities and skills:

Crisa, an Airbus company, is a well renowned supplier of complex on board electronics for space. More than 30 years' experience, more than 400 employees and 800 electronic units flown into space back Crisa's capabilities in the design and manufacturing of complex electronic equipment for satellites and launchers.

The company's activities cover a wide product range like system engineering, power distribution units, power control units, DC/DC converters, cooler electronics, launcher electronics, driving electronics, electrical propulsion electronics, front-end electronics, on board computers, remote terminal units, video processing, microelectronics or antenna driving.

In this way Crisa has played a relevant role in most ESA's scientific or Earth Observation missions (ie. Rosetta, GAIA, LISA Pathfinder, BepiColombo, EarthCARE, SolarOrbiter, GOCE, Mars and Venus Express, Herschel/Planck; Sentinels, Pleiades, Ingenio, Cheops, MTG ….), many Telecommunication programs for Commercial Operators (platforms Eurostar E3000, AlphaBus SmallGEO, and Quantum) and NASA scientific missions (ie.Rover Curiosity – MSL, Rover 2020 to Mars). At the moment, the company is working on important scientific missions and programs like JUICE, Ariane 6 and Vega C launchers, Myriade Evolutions or MetOp.

Crisa has expanded its engineering and project management skills in other ground projects. Some of these projects include network architecture design for secure communications; control center implementation, operation and maintenance; archiving and cataloguing systems; remote operation.

Crisa is able to provide reliable electronics designed for harsh environments like space or fusion under radiation and no-maintenance conditions. The company has also a strong knowledge of system engineering and project management.

### Large scientific facilities and national research facilities contracts:

Crisa engineering activities are mainly framed within the space environment. Development of electronics for space implies dealing with very high radiation levels, vacuum conditions, high temperature changes, tolerance to shocks, and most of all, reliability, since no repair is possible. Some relevant contracts for scientific facilities achieved by Crisa are:

Electronics for High Energy particle Physics:

Crisa has been responsible for designing and manufacturing the Cryomagnet Avionics Box (CAB), a challenging electronic unit to power and monitor a superconducting dipole magnet that was built to form part of the Alpha Magnetic Spectrometer (AMS-02), a particle physics detector

on board the International Space Station (ISS). The AMS was the first large superconducting magnet in space with application in radiation protection, propulsion system, power generation and energy storage.

The project was conducted under the technical supervision of CIEMAT, with funding provided by CIEMAT, CDTI and ETH-Zurich.

CODAC Engineering Support Framework contract:

Crisa was awarded with an Engineering Support Framework Contract for Control & Data Acquisition Communication Systems (CODAC) and heating Current Drive division. Contract ref.: ITER/CT/6000000014.

European Space Agency (ESA):

Electrical Power Subsystem (EPS) for JUICE mission to Jupiter, GOCE PCDU & Electric Propulsion IPCDU, On Board Computer for 2020 ExoMars Rover NASA mission to mars, among many other contracts with ESA.

**R&D projects:**

Some of the most recent R&D projects:

- Development of High Power PCDU (Power Conditioning and Distribution Unit) for low orbit high power satellites, compliant to any Solar Panel Interface and Bus Voltage.
- High quality and reliability modular Instrument Control Unit (ICU) with flexible architecture.
- Design, integration and verification of High Voltage elements for satellite Electric Propulsion Systems.
- Lead-free automatic manufacturing line for aerospace electronics.
- Optimized low-cost electronics for Mega Constellations

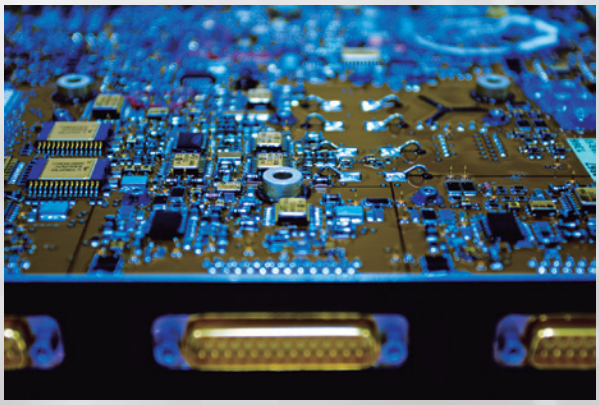
**Markets:**

Defense / Space

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, PECAL/AQAP 2110, ECSS-Q-ST-70-38C, 08, 28, 38&26

Manufacturing of space proven electronics



Manufacturing of radiation hardened electronics

| | |
|---|---|
| **COMPANY NAME** | **CRYOVAC S.L.** |
| **ADDRESS** | **C/Arquimedes 40, 28946 Fuenlabrada, Madrid** |
| **WEB** | **www.cryovac.es** |
| **TURNOVER** | **≈ 3M€ in year 2016** |
| **EMPLOYEES** | **18 in year 2016** |
| **CONTACT PERSON** | **Samuel Gilliland** |
| | **POSITION Technical Director** |
| | **PHONE +34 916 065 463** |
| | **EMAIL info@cryovac.es** |
| | **SME Yes** |


### Company activities and skills:

Cryogenics, vacuum, fabrication and installation of high pressure equipment, control systems and precision machining and welding.

Vacuum: We design and manufacture custom made vacuum chambers for pressures down to 10-10 mbar. We also provide vacuum line installations and auxiliary systems such as lifting mechanisms, support structures, pumps and instrumentation.

Cryogenics: We fabricate and install customisable vacuum insulated lines for all cryogenic liquids. We also design and manufacture custom cryostats, thermal vacuum chambers and temperature control equipment for heating and cooling by cryogenic liquid or cryocooler.

High pressure: We design and fabricate CE approved high pressure vessels, reactors and cells compatible with cryogenic to high temperatures. We also install and legalise high pressure gas tubing and auxiliary equipment in laboratories.

Control systems: We design and build hardware and software based control systems for temperature, vacuum, high pressure gases and cryogenic liquids.

Precision machining and welding: We provide high tolerance machining for materials including inconel, Cu-Be, titanium and tungsten carbide. Our welders are certified in several techniques including TIG, brazing and orbital welding.

### Large scientific facilities and national research facilities contracts:

[ESRF] Sample environment for high pressure diamond anvil cells (2016)

[IFMIF] IFMIF EVEDA Mechanical Structures (2015)

[CERN] DO-28141 - “Supply of supports for HIE-ISOLDE transfer line equipment” (2013)

[CERN] DO - 27581 - “The supply of five hydrogen buffer volumes” (2012)

[XFEL] XFEL Magnet Assembly (2011)

[ILL] High pressure large volume neutron diffraction cells (2010)

### R&D projects:

[MINECO-Retos Colaboración Large] Volume Cells for the Study of Materials in Extreme Conditions of High Pressure, Magnetic Field and Temperature, 2015-2018.

[CDTI-EEA Grants] Cryogenic Transfer Lines: The Next Generation, 2014-15.

[CDTI-IDI] Instrumentation for Small Diamond Anvil High Pressure Cells, 2013-14.

[CDTI-IDC] Conception of Large Volume High Pressure Cells for Neutron Diffraction, 2010-11.

**Markets:**

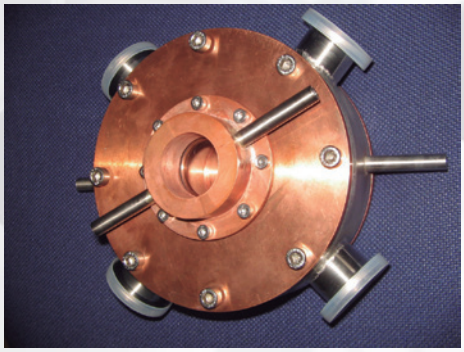
Nuclear / Defense / Naval / Aeronautics / Space / Energy / Oil& gas / Other Medical and alimentary CT Engineering

**Quality certifications, nuclear qualifications:**

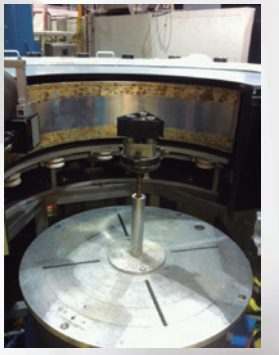
ISO 9001, Official high pressure fabricator (FAP-147), installer (EIP-2-75) and repairer (ERP-2-3)

CRYOVAC CERN-ISOLDE

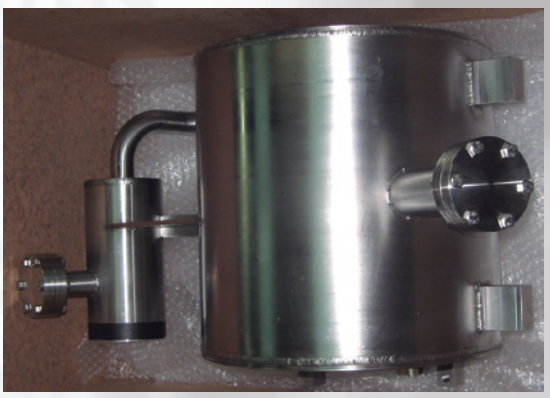
CERN H2 buffers



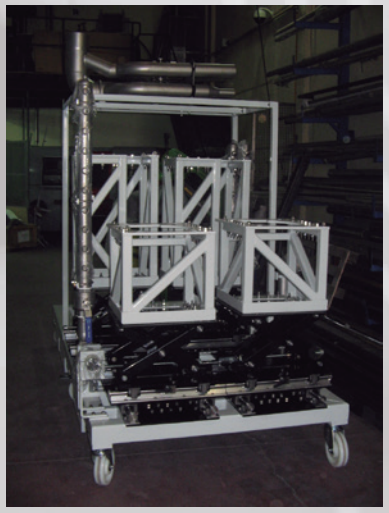
ESRF-Sample_environment



ILL-Cell



XFEL-Magnet



CRYOVAC IFMIF-Structure

| | |
|---|---|
| **COMPANY NAME** | **THE CT ENGINEERING GROUP** |
| **ADDRESS** | **Avda. Leonardo da Vinci, 22. Parque Empresarial La Carpetania. 28906 Getafe (Madrid, Spain)** |
| **WEB** | **www.thectengineeringgroup.com** |
| **TURNOVER** | **85 M€ in year 2016** |
| **EMPLOYEES** | **1,500 in year 2016** |
| **CONTACT PERSON** | **Vicente Egea** |
| | **POSITION General Manager** |
| | **PHONE +34 916 832 030** |
| | **EMAIL vegea@ctingenieros.es** |
| | **SME No** |

### Company activities and skills:

The CT Engineering Group provides engineering services to the aeronautical, naval, automotive, rail, industrial plants, energy, architecture and construction sectors. The portfolio of services covers the entire product life cycle: from design, product engineering, manufacturing engineering to post-sales support engineering. Our mission is to provide innovative and technological solutions to make our customers more effective and competitive.

With more than 25 years of experience, technical expertise and 1,500 engineers, we adapt to exceed the expectations of the client. The CT Engineering Group has offices in Spain (Madrid, Barcelona, Bilbao, Seville, Ferrol, Vigo, Puertollano, Cartagena and Cadiz), France (Paris, Marseille, Toulouse and Nantes), Germany (Hamburg and Munich), United Kingdom (Bristol), Brazil (Rio de Janeiro) and India (Bangalore). The CT Engineering Group has been involved in several projects for the nuclear sector during the latest 6 years. We have participated with more than 100.000 hours of nuclear sector projects such as ITER, CERN or Fusion For Energy. Additionally The CT Engineering Group is a preferred supplier for product engineering (E2S) and manufacturing (ME3S) services for the entire Airbus Group in the world. In the naval area, The CT Engineering Group is a reference supplier in all Navantia factories as well in the automotive sector in Nissan and Renault facilities; in the rail sector, with Talgo and in industrial plants, with Repsol.

### Large scientific facilities and national research facilities contracts:

ITER. Supervision of the substations PBS41 and PBS43 (2015-currently): Since August 2015, Electrical Engineering Business Unit is working with Siemens and Ferrovial in the ITER Project (France). We started doing the supervision of the existing engineering on the 22 kV and 6,6 kV substations of the American part (PBS43). Also, we work on the complete integration of all the different parts (400 kV, 66 kV, 22 kV and 6,6 kV) in the two huge substations of the project, the American one (PBS43) and the Chinese one (PBS41). We have already delivered the drawings for the Construction Design of the American 22kV Substation (PBS43).

Iberdrola. Winkinger WIndfarm Project. (2014-currently): We have already provided detail engineering of the electrical substation and have assured the constructive viability of the topsides of the electrical substation. Moreover, we did the validation phase of the wind turbines and ensured the requirements in the electrical cabinets, the main and auxiliary transformer and the Air Handling Unit (AHU). Currently we carry out property engineering and commissioning. We supervised the installation of the wind farm substation and is in charge of supervising the commissioning of the wind turbines.

Fusion For Energy. Framework Service Contract (2016-currently): Provision of CAD Design Services, general mechanical and plant design with Catia V5

ITER. Vacuum vessel mechanical analysis. (2016): The project scope consisted of detailed piping engineering, preliminary lists of material, piping plans and isometrics, stress analyses for piping and equipments, 2D/3D pipe support drawings and final lists of material. We provided these services in INITEC Westinghouse facilities.

Tecnatom. Pannel of main control room. (2016): We provided design, development & calcule with finite elements of main console, 3D models, product structure & assembled and drawings of manufacturing.

CERN. Mechanical desing services (2009-2012). The CT Engineering Group is qualified by CERN for providing mechanical engineering services. We have worked on several projects: Design and Draughting works in Mechanical Engineering for the Accelerator components and Detector components (collection and analysis of design requirements definition and documenting, execution of pre-studies and studies of mechanical components, assemblies, machines, machine integration and layout, including, mechanical analyses and computations), mechanical design services (provision of mechanical design and drafting work to be performed both at the contractor premises and on the CERN site) and services of civil engineering design work at CERN (design studies and related documents of civil engineering works and civil engineering structure of the accelerator).

**R&D projects:**

CEA Caradache.Experimental installation on the hydro-mechanical behavior in a nuclear reactor (2016-currently). The CT Engineering Group participates in this R&D project providing a mechanical tool to manipulate hydraulic tensil tool in Laboratory. The scope of the project concerns an experimental installation on the hydro-mechanical behavior in a nuclear reactor.

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy / Oil& gas /
Other: Rail, Architecture & Construction

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, EN9100 and ISO 27001, DGAM, ISO 18001 (Working in progress)

Electrifying- The very high voltage electrical substation on the south side of the platform (Photo ITER OrganizationEJF Riche)

Iberdrola's substation installed at german Wikinger offshore wind farm (Photo Iberdrola)

**COMPANY NAME** DAS PHOTONICS, S.L.
**ADDRESS** Camino de Vera, s/n, Edificio 8F, 2ª Planta, 46022 Valencia
**WEB** www.dasphotonics.com
**TURNOVER** 4.2 M€ in year 2015
**EMPLOYEES** 42 in year 2015
**CONTACT PERSON** Santiago Simón
**POSITION** Business Development Director
**PHONE** +34 963 556 150
**EMAIL** ssimon@dasphotonics.com
**SME** Yes

## Company activities and skills:

DAS PHOTONICS was created in 2005 as a spin-off company from the Nanophotonic Technology Centre (NTC - Polytechnic University of Valencia, http://www.ntc.upv.es/), focused on the development of innovative value-adding products based on our proprietary photonics technology. Our products are at the forefront of R&D in Photonics for Space, Defence, and Aeronautics. DAS is recognized internationally as a leading company in the field of RF-photonics for Defense and Space applications. The company exploits the advantages of photonics technology to offer solutions with improved bandwidth, mass and power consumption, compared with electronic/RF implementations.

For Space, DAS develops solutions for both, ground segment and on-board systems, exploiting the benefits provided by photonic technology, such us significant mass, size and power consumption reduction, instantaneous bandwidth (from near DC to above 40 Ghz) phase stability, long transmission distance as well as EM immunity. The current applications developed by DAS Photonics are in the line of photonics links for digital and anologue signals remoting, multi-frequency conversion and antenna beamforming.

## Large scientific facilities and national research facilities contracts:

2013 INTA- Exomars: Proposal for the development of the RAMAN laser unit.

2009 ESA AO/1-6034/09/F/MOS - Future Architecture of ESA Deep Space Stations for Enhanced Mission Support. Reference: GRST-SYST-GST-SOW-1002-OPS-GSS

2008 ESO Front End Integration Centre Local Oscillator Photonic Reference Synthesizer Test Module (LOTRM) - Generation of mm-Wave LO by using photonic harmonic conversion techniques (27.3 GHz till 124.34 GHz) in order to be used as test equipment for validating the ALMA radiotelecope front-ends (Atacama, Chile) – Reference 19766/ESO/08/17259/YWE

## R&D projets:

2012 ESA ARTES 5.1. AO/1-5395/07/NL/EM – Optical Multi-Frequency Conversion Unit for Broadband Transparent Analogue Repeaters

2011 ESA ARTES 5.2 & ARTES 3.4. IoV - Optical RF distribution Flight Demonstrator

2011 ESA ARTES 5.1. Opto-Microwave Wideband Reconfigurable Receiver

2009 ESA TRP AO/5809/08/NL/CP - Electro-photonic ADC

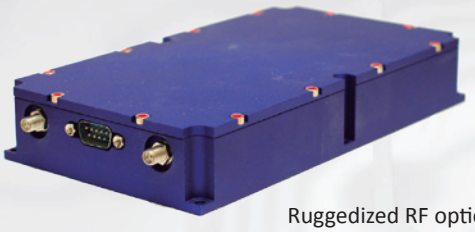
… up to 18 ESA projects (TRP, GSTP, GSP, ARTES, …)

**Markets:**

Defense / Aeronautics / Space

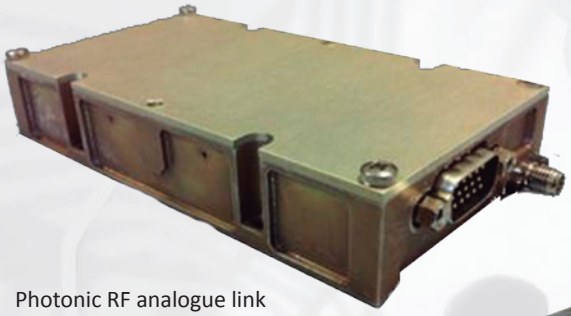
**Quality certifications, nuclear qualifications:**

ISO 9001, AQAP 2110, ISO 9100



Ruggedized RF optical delay line


Rack mounted photonic RF analogue link up to 40 GHz



Photonic RF analogue link for space applications


RF optical delay line


ALMA LORTM

**COMPANY NAME** DEIMOS SPACE
**ADDRESS** Ronda de Poniente 19 Edificio FITENI VI, 28760, Tres Cantos, Madrid, Spain
**WEB** www.elecnor-deimos.com
**TURNOVER** 23.5 M€ in year 2015
**EMPLOYEES** 321 in year 2015
**CONTACT PERSON** Ignacio Tourné
**POSITION** Business Development Director
**PHONE** +34 918 032 895
**EMAIL** ignacio.tourne@deimos-space.com
**SME** No

**Company activities and skills:**

- Space systems engineering
- Data processing systems (Earth observation, science…)
- Implementation and operation of space surveillance & tracking (SST) telescopes
- Satellite and payload systems integration

**Large scientific facilities and national research facilities contracts:**

- [INTERNAL FUNDING] Deimos Sky Survey: Implementation and Upgrades of SST Telescopes and Processing Centre (2015-2017)
- [ESA] Spanish Space Surveillance and Tracking System (S3T): Data Centre Catalogue Generation (2015-2017)
- [ESA SEISOP], Space Weather Prediction System (2011)
- [ESA, CDTI, INTERNAL], Various SST Object Cataloguing Campaigns based on Optical Observations (2006-2014)

**R&D projets:**

- [FP7 & H2020] NEOShield (1 & 2) 2 - Near-Earth Object Impact Mitigation & Prevention, 2012 & 2015
- [ESA] Sentinel-3 Instrument Processing Facility, 2012 (example of the many references in data processing systems)
- [ESA] DCII – SSA Data Centre Processing Chain and Sensor Simulator, 2012
- [ESA] SN-VII NEO Impact Effects and Mitigation Measures, 2011

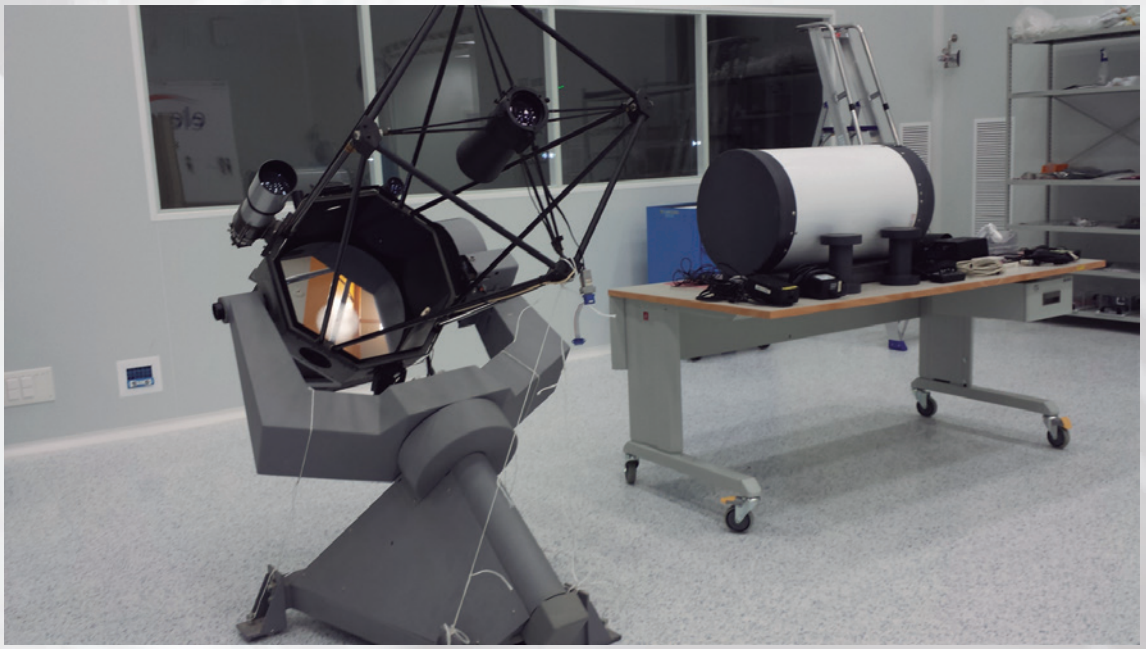
**Markets:**

Defense / Naval / Aeronautics / Space / ICT Solutions

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, PECAL/A CAP 2110

[Deimos Sky Survey/ESA] Refurbishment of CENTU1 & TRACKER telescopes for Space Surveillance and Tracking at ELECNOR Deimos integration facilities, 2015



[Deimos Ground Station/ELECNOR-Deimos] Integration of the 10 m TTC Ground Station for Deimos-2 Satellite, 2013

| | |
|---|---|
| **COMPANY NAME** | **DMP** |
| **ADDRESS** | **Pol. Ind. Kurutz Gain, 12-13, 20850 Mendaro (Guipuzcoa)** |
| **WEB** | **www.dmp.aero** |
| **TURNOVER** | **14,615 M€ in year 2016** |
| **EMPLOYEES** | **105 in year 2016** |
| **CONTACT PERSON** | **Philippe Roulet** |
| | **POSITION Commercial Director** |
| | **PHONE +34 647 642 960** |
| | **EMAIL philippe@dmp.aero** |
| | **SME Yes** |

**Company activities and skills:**

Extreme precision machining of copper components and systems for accelerating structures and associated devices (discs, pets, yokes, extraction systems, RFQs, …)

Collaborative projects for design, manufacturaring, assembly and test of BUNCHERS, CYCLOTRONS, NANO-MOVERS.

Cryo-mechanisms and for space or ground optical instruments

**Large scientific facilities and national research facilities contracts:**

CIEMAT - Accelerating structure for clic - in course

CIEMAT - Cyclotron for medical application - 2016

CEA - Cryomechanism for euclid mission - 2016

CIEMAT - Buncher IFMIF - 2015

CIEMAT - Movers XFEL - 2014

**R&D projets:**

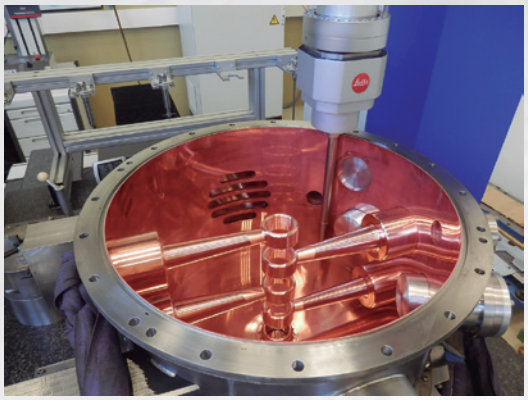
4ACCEL CDTI - Design, Manufacturing and Testing of a Technological Demonstrator of an Linear Collider Accelerating Structure based on the quadrant or half shape concepts – 2010 (leader DMP, partners CERN-CIEMAT)

**Markets:**

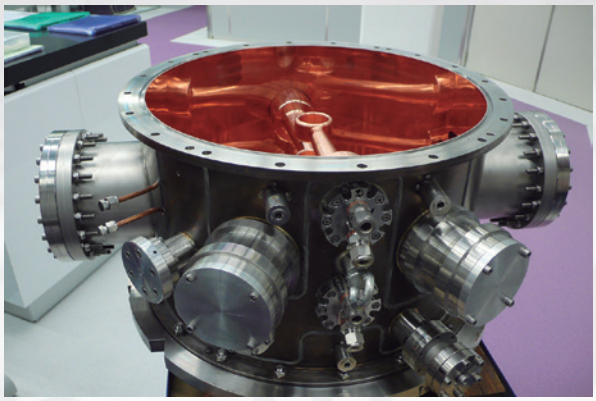
Defense / Space / Aeronautics/ Proton therapy / Photolitography / Air-Bearing systems

**Quality certifications, nuclear qualifications:**

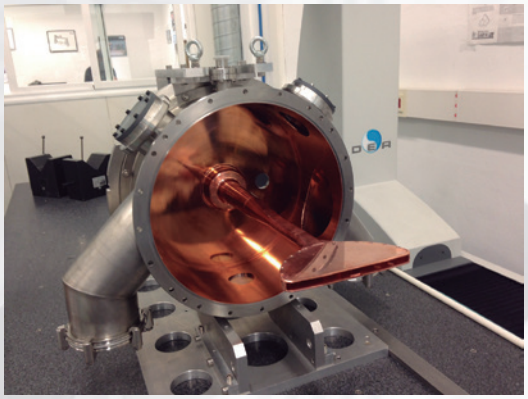
ISO 9001, EN9100



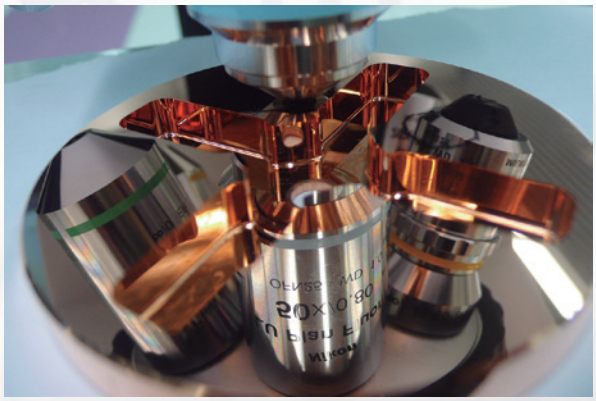
Buncher. CIEMAT (IFMIF)



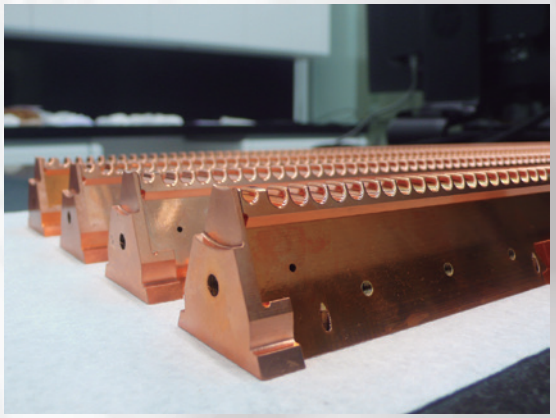
Buncher. CIEMAT (IFMIF)



Cyclotron. CIEMAT



Disc (CERN)



PET (CERN)

DRAGADOS

| | |
|---|---|
| **COMPANY NAME** | **DRAGADOS, S.A.** |
| **ADDRESS** | **Avenida del Camino de Santiago, 50, Madrid. Spain** |
| **WEB** | **www.dragados.com** |
| **TURNOVER** | **4,152.32 Million euros in year 2015** |
| **EMPLOYEES** | **4,269 in year 2015** |
| **CONTACT PERSON** | **Juan Miguel Pérez Rodríguez** |
| | **POSITION International Business Development Manager** |
| | **PHONE +34 917 038 114** |
| | **EMAIL jmperezr@dragados.com** |
| | **SME No** |

**Company activities and skills:**

DRAGADOS, S.A and its group of companies form part of ACS Group Construction Division.

ACS Group appears in 2016 ENR Global Construction Book as the 6th largest International Contracting Group with a total annual turnover of 34.95 Billion € in 2015 and the 1st International Contractor.

DRAGADOS, S.A. is founded under the Spanish Law and it has been incorporated in the Madrid Mercantile Register (Spain) for 70 years by former companies. DRAGADOS, S.A. is nowadays the largest Construction Contractor in Spain with total sales of 4,152 Million € in 2015.

DRAGADOS has been present in the international markets during more than 40 years, working in different and important projects, and some of them have reached great worldwide acknowledgement.

DRAGADOS, S.A and its Subsidiaries have more than 10,000 employees, 30 Branches in Spain and it has offices in Poland, Greece, Ireland, Portugal, United Kingdom, USA, Canada, Venezuela, Chile, Argentina, Peru, Colombia, Mexico and Australia . In all these countries, DRAGADOS, S.A. carries out its activities in the Civil Works field (from Transportation Infrastructures, Hydraulic and Underground Works to Marine Works or Environmental Infrastructures). DRAGADOS is also working in the Vertical Building Sector.

DRAGADOS, S.A. has carried out some outstanding projects all over the world:

Civil Engineering Works:Roads, Highways (more than 10,500 km executed), railways and subways (2,900 km constructed), bridges (more than 1,500 Km), hydraulic works (more than 250 dams), airports (3.7 million m2 of runways and 1 million m2 of Terminals), industrial installations, marine works (more than 200 km of breakwaters and wharves), urban planning, sewage systems and power plants.

Vertical Building Works: Apartment and Commercial buildings, Tourist Resorts, Industrial Buildings, Sport and Cultural Facilities, Restaurants, Office Complexes and Car Parks (more than 3,642 building projects).

The experience, human resources, technical capability and financial solidity of DRAGADOS enables it to deal with any project regardless of its complexity or size.

As a major international contractor, DRAGADOS has extensive experience working on challenging projects, including complex building and tunneling projects during all the phases of the project : since first analysis to the process of selection of subcontractors, complying with all contractual requirements for the different materials.

DRAGADOS is a specialist in the construction of buildings for clients that seek the best result for their proposed structures, require strict construction schedules, the application of new project-specific construction technologies, and high quality facilities and finishes all under the guideline of a sound quality and project management program.

DRAGADOS provides its Clients with its management experience on major construction as well as its deep knowledge of every phase of building process, especially regarding the coordination and inspection of the different suppliers and subcontractors. DRAGADOS also offers to its Clients an integrated management system where quality, environment, community and safety are addressed in an interrelated approach. DRAGADOS provides the required expertise to be ISO 9000 and ISO 14000 compliant and implements OSHAS 18000.

In 2016, DRAGADOS obtained the Certificate of Energy Management System issued by AENOR according to UNE-EN-ISO-50001

**Large scientific facilities and national research facilities contracts:**

LHC - Civil Engineering Construction, Package 2 - Contract T053/ST/LHC at Point 5 (CMS), Cessy (France) C.E.R.N. - European Organization For Nuclear Research - 2005

Ascó Nuclear Power Plant Units I and II Refrigeration and Water Discharge Enlargement in Ascó, Tarragona (Spain). Ascó Nuclear Association - 1995

Nuclear Power Plant in Trillo, Guadalajara (Spain) Unión Fenosa - 1988

Vandellós Nuclear Power Plant Group II Civil Works in Vandellós, Tarragona (Spain). Ascó-Vandellós II Nuclear Association - 1985

Refrigeration Towers (Natural flow) for Trillo Nuclear Power Plant Group I in Trillo, Guadalajara (Spain). Unión Fenosa - 1983

Almaraz Nuclear Power Plant Civil Works in Almaraz, Cáceres (Spain). Almaraz Nuclear Power Plant - 1975

LHC - CERN

Ascó

| | |
|---|---|
| **COMPANY NAME** | **DURO FELGUERA CALDERERÍA PESADA, S.A. (DFCP)** |
| **ADDRESS** | **Travesía del mar, s/n 33212 Gijón (Asturias) Spain** |
| **WEB** | **www.dfdurofelguera.com** |
| **TURNOVER** | **41,500,000 € in year 2016** |
| **EMPLOYEES** | **170 in year 2016** |
| **CONTACT PERSON** | **José Manuel Sirgo** |
| | **POSITION Sales Director** |
| | **PHONE +34 985 322 600** |
| | **EMAIL dfcpsales@durofelguera.com** |
| | **SME No** |

**Company activities and skills:**

Duro Felguera Calderería Pesada (DFCP) is the company belonging to Duro Felguera group (DF) that specialises in the manufacturing of high quality pressure vessels for the oil&gas, petrochemical and nuclear industry.

Together with other DF companies belonging to DF Manufacturing line has participated inseveral international laboratories and research centers (see references below).

Our facilities, over 76,000 square meters and only 1.5km from Gijón Commercial Port, are equipped with state-of-the-art manufacturing technologies and provide direct access to the sea through their own dock.

Besides, DFCP is certified according to the main international Codes and standards for nuclear and non-nuclear projects. Thus, DFCP currently holds among others, N, NPT and NS ASME Certificates of Authorization. This certifications signify DFCP capabilities to meet the highest quality requirements of the market.

**Large scientific facilities and national research facilities contracts:**

- Manufacturing of 403 Vacuum Vessels for CERN (Switzerland) and KEK (Japan)
- Manufacturing of 106 Services Modules for LHC (Switzerland)
- Manufacturing of a prototype Vacuum Vessel and Cold Mass for X-FEL (Germany)
- Manufacturing of 2 hadronic wedge calorimeters for CMS Detector (Switzerland)
- Manufacturing of 8 Cryostats for ATLAS Detector (Switzerland)

**R&D projets:**

DFCP is deeply committed to investing in Research & Development. In recent years DFCP has taken part in several regional, national and European R&D projects, which has enabled the company to strengthen its technological capabilities and anticipate market needs.

**Markets:**

Nuclear, Oil& gas

**Quality certifications, nuclear qualifications:**

ASME, 9001, 14001

DURO FELGUERA Facilities

EMPRESARIOS AGRUPADOS


**COMPANY NAME** EMPRESARIOS AGRUPADOS INTERNACIONAL, S.A.
**ADDRESS** Calle Magallanes, 3 28015 Madrid (Spain)
**WEB** www.empre.es
**TURNOVER** 46.978 k€ (year 2015)
**EMPLOYEES** 982 (35 trainees included) (year 2016)
**CONTACT PERSON** María Teresa Domínguez Bautista
**POSITION** Advanced Projects and R&D Director
**PHONE** +34 913 098 022
**EMAIL** mdb@empre.es
**SME** No


## Company activities and skills:

Empresarios Agrupados Internacional, S.A. is an engineering consultant/architect-engineering company founded in 1971. Acting for international operations as Empresarios Agrupados Internacional, S.A., it has a permanent staff of over 1000.

EA is a leading organisation with significant experience worldwide. It provides complete solutions in the fields of consultancy, project management, engineering and design, procurement, construction management, testing planning, nuclear safety support, quality assurance, as well as support to operation in the following areas and industrial sectors:

- Nuclear power plants (new built) and support to NPPs in operation
- Conventional power generation (coil and gas)
- Aerospace
- Defence and civil aviation
- Information technology
- Large infrastructures and scientific research installations
- Innovative nuclear systems and research reactors for fission and fusion technologies
- Decommissioning and radioactive waste management, including design of low and intermediate level waste treatment and spent fuel storage facilities

## Large scientific facilities and national research facilities contracts:

CDTI,aceleradores y tecnologías asociadas para grandes instalaciones, 2017-ongoing

ITER Organization (IO), Final design of the Connection Pipes for the Test Blanket System Contract (TBS-CP), 2016-ongoing

CIEMAT/ EUROFUSION, DONES (DEMO-Oriented Neutron Source), 2016-ongoing

CIEMAT/F4E Grant F4E-GRT-771, 2016-ongoing

CIEMAT/ EUROFUSION, Test Blanket Modules (TBM) Systems, 2015-ongoing

ITER Organization (IO), Tokamak Cooling Water System (TCWS) – Thermohydraulic Analysis, 2015-ongoing

ITER Organization (IO) Central Safety System Nuclear (SCS-N), 2013-ongoing

ENSA, Design of ITER Detritiation Water System Tritium Tanks, 2013-ongoing

F4E-ENGAGE, Architect Engineering Services for ITER Building, 2010-ongoing

**R&D projets:**

EA has carried out several nuclear projects for international institutions and research and development programmes of the European Union, the World Bank and the European Bank for Reconstruction and Development.

EA has participated in more than twenty (20) EURATOM projects, funded by the EU Framework Programmes for the development of advanced nuclear reactor technologies (GEN IV).

EA has more than twenty (20) years of experience in the field of nuclear fusion technology development, starting with the ITER Engineering and Design Phase (EDA).

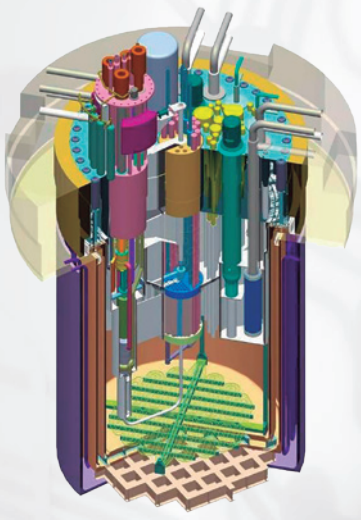
**Markets:**

Nuclear / Defense / Space / Energy / Oil&gas

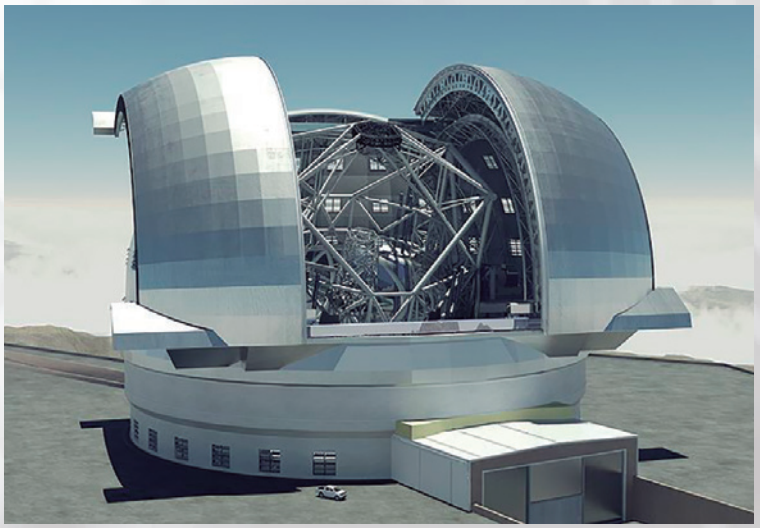
**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

ITER Buildings



MYRRHA



Telescopy E-ELT 39 m Primary Mirror

**COMPANY NAME** EIIT
**ADDRESS** Calle Monte Escorial 5, C.P. 28200 Madrid, Spain
**WEB** www.eiit.com
**TURNOVER** 6.3 M€ in year 2016
**EMPLOYEES** 54 in year 2016
**CONTACT PERSON** Pablo Moraga Montejo
**POSITION** Business Unit Manager
**PHONE** +34 918 904 614
**EMAIL** pmoraga@eiit.com
**SME** Yes


### Company activities and skills:

EIIT is a multidisciplinary engineering team, fully committed to innovating: we develop solutions and have our own line of products for aeronautics, electronic product tests and automotive tests. We give shape to the needs and expectations of our customers to ensure the production of their products, complying with all quality and safety parameters and always safeguarding confidentiality.

- EIIT started business in 1986. EIIT based its foundations on offering high levels of engineering, security and the vision required to start a business focused on the development of automatic test systems for electronics such as ICT (In Circuit Testing) and functional tests; This product line continues to be developed, increasing the technological capabilities and possibilities for different levels and customer requirements and standards. In 2000, EIIT began its activities in the aeronautics industry, transferring its previous knowledge and experience in automatic test systems and becoming a renowned supplier in most Airbus divisions, including Airbus Defence & Space and Airbus Helicopters. Using mechanical and automotive resources, EIIT started at that time in parallel the development of special machines, assembly and test lines, mostly for the automotive electronics industry.

- EIIT is a leading engineering company, with experience in the design, manufacture and commissioning of test equipment for all industry fields, supply automation solutions for the assembly, functional testing, simulation and quality control of electronic components for consumer, automotive, energy sector and aerospace electronics. EIIT strives to surpass customer expectations, by having a highly trained and motivated engineering department and very flexible project management approach, allowing us to deliver our products and projects without delays.

### Large scientific facilities and national research facilities contracts:

ITER // Industrialisation and Procurement of the ITER Interlock Discharge Loop Interface Boxes (DLIB) // 2015 – Currently

The interlock current loops are hardwired connections between the different equipment involved on the protection of the ITER superconducting coils and associated systems.

The ITER Control System Division will provide a common mechanical and electrical interface to all the ‘users’ of these hardwired loops: the Discharge Loop Interface Box or DLIB. The base of the communication between the hardwired loop and the different actors is the DLIB.

This includes the quench detectors, fast discharge units, protective make switches and AC/DC converters.

When an interlock event requiring a fast discharge of the superconducting coils occurs, the information is transmitted from the sensors to the actuators by the interruption of 3 redundant discharge loops.

- In order to increase reliability and tolerance to spurious triggers, the loop is implemented using a 2oo3 voting architecture, in order to activate the interlock action of the corresponding discharge loop. This way in case of a single signal trigger the system remains working and the coils powered.

This electronic component has the main task of maintaining the continuity of the three wires of the loop, while interfacing the users of the loop.

- Each DLIB reads the states of each sensor or controller, provided also via three wires, and propagate the state to the loop opening it or keeping its previous state. Depending on the case, it is configured to send the controller/actuator an 'open loop' state if the loop has been opened. This way the controller is able to react based on the state of the loop.

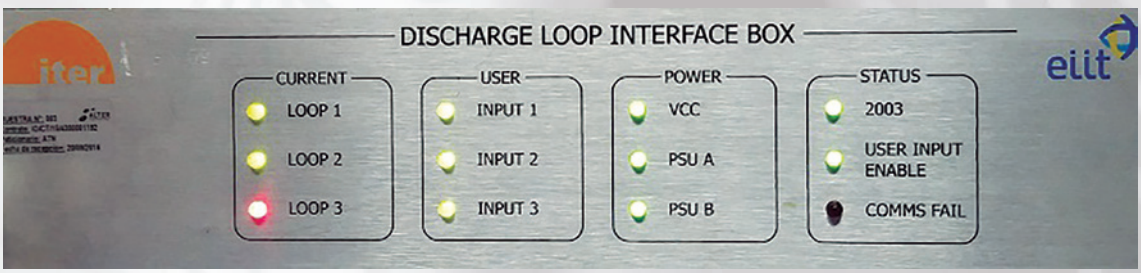
- Each DLIB is also connected to a PLC for monitoring and testing purposes. Intensive R&D program and prototyping campaigns have been carried out by IO during the last five years for obtaining an optimal design.

**Markets:**

Aerospace / Defense / Automotive / Railways / Telecommunications / Industrial Electronics / Consumer Electronics / Renewable Energies

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 9100




EIIT DLIB

**COMPANY NAME** ELDU
**ADDRESS** Ctra. Bilbao-Galdakao, 11-13. 48004 Bilbao (Vizcaya) Spain
**WEB** www.eldu.com
**TURNOVER** 69 M€ in year 2015
**EMPLOYEES** 650 in year 2015
**CONTACT PERSON** Ignacio Romera
**POSITION** Director of Corporate Development
**PHONE** 944 116 500
**EMAIL** iromera@eldu.com
**SME** Yes

## Company activities and skills:

At ELDU we offer a global energy service to all kinds of companies. We have more than 50 years' experience and can proudly state that we are sector leaders.

We originated as a company that specialized in the erection and maintenance of high voltage electrical installations, but we soon grew and branched out into other fields. We are currently providing the following services:

- Basic & Detailed Engineering
- Comprehensive Project Management
- Assembly and commissioning
- Preventive-Corrective maintenance for High Voltage systems: Substacions, power transformers, LAATS, LSMT.
- 24-hour breakdown service
- Thermography
- Protection trials
- Providing support during operation

We work all over Spain and also abroad: Chile, Argentina, Brazil, Nicaragua, Venezuela, Mexico, the United States, France, Portugal, Nigeria and South Korea.

## Large scientific facilities and national research facilities contracts:

- European Space Agency (ESA)

Supply and installation of Automatic capacitor banks

- ESAC

Maintenance of transformer centers &thermography

- Tecnalia (InGrid Building -Research, Development and Certification Laboratories for Electrical Equipment for Smart Grids) 2015

– Construction of one 220 KV substation, including the position for a 300 MVA power transformer (1second), with adjustable secondary between 3 and 38 KV for test purposes.

– Disassembling the laboratory in Burzeña, transportation, assembly and putting the laboratory back into operation in the InGrid Building.

– General Medium Voltage and Low Voltage electrical installations in the InGrid Building

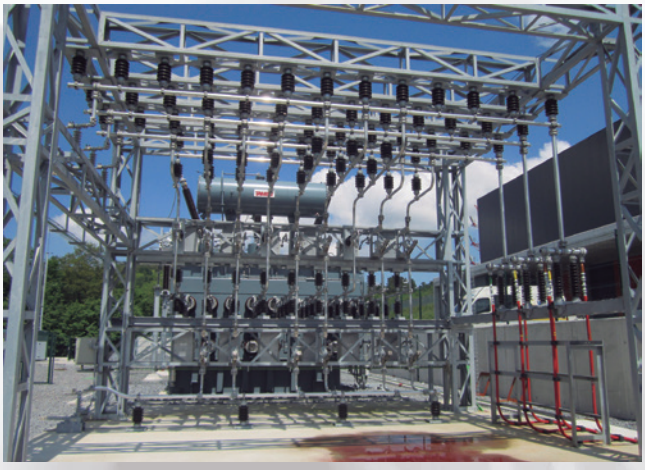
**Markets:**

Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, ISO 50001, OHSAS 18001


Construction of one 220 KV substation



Construction of one 220 KV substation


Predictive-Preventive Maintenance

| | |
|---|---|
| **COMPANY NAME** | **ELYTT ENERGY, S.L.** |
| **ADDRESS** | **Calle Orense 11, 2º B, 28020 Madrid. Spain** |
| **WEB** | **www.elytt.com** |
| **TURNOVER** | **11,6 Million € in year 2015** |
| **EMPLOYEES** | **40 in year 2016** |
| **CONTACT PERSON** | **Ángel García** |
| | **POSITION Sales Manager** |
| | **PHONE +34 619 039 199** |
| | **EMAIL angel.garcia@elytt.com** |
| | **SME Yes** |

### Company activities and skills:

Elytt Energy designs and manufactures resistive and superconducting electromagnets for particle accelerators of all types and designs and manufactures current regulated power supplies with high stability, low noise and reliability used in accelerators and research laboratories

The company provides a complete electromagnetic engineering, design, manufacture, and test service.

Designs standard and custom-built resistive magnets, reaching from small correctors, to very large magnets, 2D and 3D is used for magnetic field modeling.

Our workshop have all manufacturing facilities necessary, winding machines, vacuum system, oven, inert gas oven and all measurement equipment

Elytt Energy offers complete magnet systems including vacuum chambers, supporting stands and matching power supplies

Dipole magnets, Quadrupole magnets, Multipole magnets, Spectrometer systems, Kickers, Septums and Bumper magnets, Scanning magnets.

Also the following related services are available, Mechanical calculations, Beam optical calculations, Vacuum calculation and design, On-site Installation.

### Large scientific facilities and national research facilities contracts:

- Supply of the handling and impregnation tooling required for the production of the PF coil magnets for ITER.
- Supply a Vacuum Impregnation System for CERN European organization for nuclear research
- Manufacturing of 10 Toroidal Field Coils for ITER. 110 Tones each.
- CERN. Supply of storage ring quadrupole magnets for the SESAME project
- CERN Supply of Beam Transfer line Quadrupole Magnets for the HIE-ISOLDE Facility
- Design of a Superconducting European Dipole for ITER project developed by EFDA.
- Design of MRID (Magnetic Residual Ion Dump) for the NBI (Neutral Beam Injector) for EFDA. ITER Project.
- Design, manufacturing and test of septa magnets for CTF3 facility at CERN.
- Design and manufacturing of 70 permanent magnet quadrupoles for CERN.

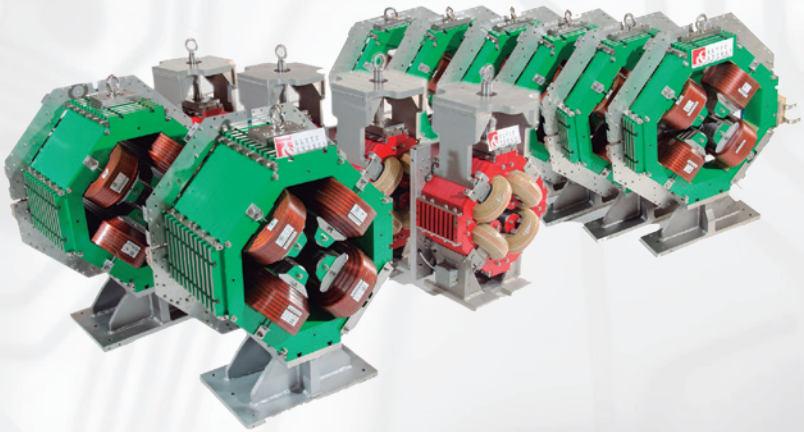
- Design of a Superconducting Dipole & Comparison study between normal conducting and superconducting solutions for FAIR Project developed by GSI.
- Design and manufacturing of a superconducting magnet module, Quadrapole & Dipole for the X-ray Free Electron Laser (XFEL) at DESY.
- Design & Manufacturing of Beam focusing solenoid & dipoles for new ISIS H- FETS.
- Design of a bending dipole for EVEDA, The focusing is provided by two quadrupole triplets and a doublet.
- Warm Dipole for Spectrograph CMAM.
- Switching magnet design & manufacturing CMAM.
- Window-Frame Warm Dipoles for Scanner CAN.
- Design of transfer lines for Technofusión.
- Design and manufacturing of focusing solenoids for very large Klystrons for CPI.

**Markets:**

Energy

**Quality certifications, nuclear qualifications:**

ISO 9001



Quadrupole Magnets

VPI Machine Toroidal Coils ITER

| | |
|---|---|
| **COMPANY NAME** | **EMBEDDED INSTRUMENTS AND SYSTEMS S.L.** |
| **ADDRESS** | **Parque Científico UMH, Avda. de la Universidad sn, 03202 Elche, Alicante, Spain** |
| **WEB** | **www.emxys.com** |
| **TURNOVER** | **400k in year 2015** |
| **EMPLOYEES** | **6 in year 2015** |
| **CONTACT PERSON** | **Jose A Carrasco** |
| | **POSITION CEO** |
| | **PHONE +34 966 442 304** |
| | **EMAIL joseacarrasco@mac.com** |
| | **SME Yes** |

**Company activities and skills:**

Electronic design of sensors and actuators, including high speed electronics, for operation in harsh evironments: extedded temperature range, radiation and vacuum. FMECA, Part Stress, Worst Case and Reliability analysis.

**Large scientific facilities and national research facilities contracts:**

European Space Agency Contract RFQ/3-14285/15/NL/PA, 2015- 2016, Optical-Fibre Temperature Sensor for Structural Health Monitoring: Engineering Model Space Assessment

European Space Agency Contract Number 4000107339//12/NL/HB, 2013-2014, RF Long Range Navigation Sensor Breadboard.

European Space Agency Contract no. 4000104613/12/NL/AD 2012-2013, Artes 5.2 –Electrically Coupled Angular Encoder for Long-Life Mechanisms.

European Space Agency Contract no. 20945/07/NL/IA, 2008-2010, Artes 5.1 - Contactless Angular Systems for Telecom Satellites Long Life Mechanisms

**R&D projets:**

2015-2016, Optical-Fibre Temperature Sensor for Structural Health Monitoring: Engineering Model Space Assessment, European Space Agency Contract RFQ/3-14285/15/NL/PA.

2012, Study of Long-Term Parametric Drifts of EEE Components for Inclusion in Component Detail Specifications and Worst-Case Analysis, Contract no. 4000103208/11/NL/CP for the European Space Agency.

2008-2013, Photonic Transceiver for Secure Quantum Communications Contract no. 21460/08/NL/IA for the European Space Agency

**Markets:**

Defense / Aeronautics / Space

**Quality certifications, nuclear qualifications:**

AES 9100

16-bit contactless angular sensor for harsh environments

Harness and backplane for satellite power distribution and data links

| | |
|---|---|
| **COMPANY NAME** | **EQUIPOS NUCLEARES, S.A., S.M.E** |
| **ADDRESS** | **Juan Carlos I, 8, 39600 Maliaño, Cantabria, Spain** |
| **WEB** | **www.ensa.es** |
| **TURNOVER** | **61,7M€ in year 2015** |
| **EMPLOYEES** | **480 in year 2016** |
| **CONTACT PERSON** | **Rubén Moreno** |
| | **POSITION Marketing & Sales - Business Development** |
| | **PHONE +34 942 200 142** |
| | **EMAIL moreno.ruben@ensa.es** |
| | **SME Yes** |

### Company activities and skills:

"Equipos Nucleares, S.A.,S.M.E." (Ensa) fabrication specializes in components such as reactor vessels including internals, supports and cover heads, steam generators, primary circuit piping, pressurizers, heat exchangers, fuel elements bundle heads, used fuel casks for storage and transport and fuel racks for both new and used fuel. Ensa facility includes a workshop capable of manufacturing the biggest nuclear components and an Advanced Technology Centre for the development and qualification of innovative manufacturing and inspection techniques, which include accredited laboratories that can supply services both to Ensa and to external customers.

Ensa has maintained a constant activity in other areas such as design and services which have had also a strong internationalization. Examples of this internationalization include the outstanding participation of Ensa in the South African project PBMR (Pebble Bed Modular Reactor), participation in IRIS (International Reactor Innovative and Secure) and provision of services in NPPs in countries such as China, Bulgaria, France and Finland. Throughout its history, the nuclear activity in Ensa has also been reconciled with the manufacture of components for research institutes (CERN, UKAEA, EPRI, Max Plank etc.) and institutions (ITER, NASA, EURATOM), and the manufacture of offshore oil platforms, support services to other firms and the manufacture of pressure components for the chemical and petrochemical industry.

Ensa conducts its business in compliance with recognized international standards and most demanding quality requirements. Ensa holds ASME accreditations (N, NPT, NA, N3 and NS stamps), ISO 9001, ISO14001, ISO/IEC 27001, UNE 166002 and OSHAS 18001. Ensa holds as well ENAC ISO / IEC accreditations for its metrology´s laboratory and its destructive test located in the Advanced Technology Centre. The current order includes the supply of equipment and services to countries like France, USA, Finland, Italy, Bulgaria, China, South Korea and Spain.

### Large scientific facilities and national research facilities contracts:

2007: Feasibility Study for the development and manufacturing of European test modules for Iter project (EU-TBM).The target of this project was to anticipate the needs and capabilities of the Spanish industry in order to successfully face the EU ITER-TBM project through a technical analysis.

2007: Feasibility Study for the Vacuum Vessel ITER project (EU-TBM). Feasibility study of the potential developments to be carried out and needed by Ensa during its expected involvement on ITER project. These technical developments were focused on the Vacuum Vessel Sectors fabrication, mainly on areas as manufacturing sequence, welding processes, testing procedures and tooling and first of a kind manufacturing devices.

2008: Advance Distortion Simulation Techniques during the manufacturing of structures for large plants. Development of a reliable technique for the prediction of distortion in large precision structures for the nuclear fusion investigation and to extend obtained results to other fields. The extremely strict tolerances require innovative control processes during the fabrication of the components, in particular, the vacuum Vessel Sectors

2012: Contract for the Vacuum Vessel and Port the Assembly. The scope of this contract awarded in 2012 by ITER Organization is the assembly at site of the Vacuum Vessel Sectors and its ports. This work required the development of many qualifications, processes (welding, control, testing, etc.) and associated devices and tools.

2013: Start with the first project stage: Development Phase where Ensa team study all the techniques that will be used during the production pahse in Cadarache, the involved technologies are:

-Welding- Narrow Gap Tig

-Machining

-NDT (VT,PT,PTC,UT,RT,HE Test)

-Dimensional control

-Tooling (positioning, robots,

2013: Contract for the Impact of narrow distance between welds and weld overlapping-Fabrication and NDT: To check that these weld configurations have no impact on mechanical properties of the main welds and do not induce defects in the main welds.

2013: Contract of Final design & Manufacturing of Tritiated Water Holding Tanks and Emergency Tanks of the Water Detriation System F4E-Iter. It was manufactured and supplied of 4 holding tanks (20 m3) and 2 emergency tanks (100 m3) for tritiated water and it was succesfully deliveried on 2015 in Caradache.

2016: Contract of the 2º part of tanks for the Water Detriation System for F4E-Iter. It includes the supply of 2 Holding Tanks (7m3) and 2 Feeding Tanks (12m3) for tritiated water.

2016: In Consortium with Empresarios Agrupados, it was awarded the Contract for Final Design of the Connection Pipes for the Test Blanket Systems, where Ensa is the responsible for the design review and support from the manufacturing point of view.

**Markets:**

Nuclear

**Quality certifications, nuclear qualifications:**

ASME, RCC-MR, ISO 9001, ISO 14001, CEFRI

Supplied stainless steel tank of Tritium

Supplied stainless steel tank of Tritium


**COMPANY NAME** ESTEYCO
**ADDRESS** Menéndez Pidal 17, 28036 Madrid, Spain
**WEB** www.esteyco.com
**TURNOVER** 17.7 M€ in year 2016
**EMPLOYEES** 164 in year 2016
**CONTACT PERSON** Fernando Rueda
**POSITION** Head of ESTEYCO Mechanics
**PHONE** +34 913 597 878 / +34 661 102 043
**EMAIL** fernando.rueda@esteyco.com
**SME** Yes

### Company activities and skills:

Structural & mechanical design and analysis, working in non-conventional problems within the very general framework of structural mechanics. Some distinct capabilities:

Nonlinear mechanics: Design of structures or components driven by stability considerations, by their response under extreme load cases, changing over time or with movable parts. Definition of critical parameters in manufacturing processes or ultimate capacity assessments and re-designs of various nuclear and civil structures and components.

Structural dynamics: Design of structures or components subjected to severe random loading (wind, wave and seismic engineering), to significant time-varying loading or with impact resistant or dynamic motion control requirements. Several realizations in the fields of flow induced vibration assessments for nuclear components, seismic analysis and design of facilities.

Heat transfer: Design of structures or components with heat removal functionalities or subjected to significant heat fluxes and/or cooling conditions. Active participation in the design of crucial ITER and DEMO plasma facing components under pulsed operation and in the thermal-mechanical evaluation of nuclear components in fission NPPs.

### Large scientific facilities and national research facilities contracts:

[ITER Organization] IO/CT/16/4300001322, "Cryostat Analysis and Structural Integrity Assessment" (2016-Ongoing): Structural integrity assessment of the ITER Cryostat according to ASME VIII, Div. 2 Part 5 Ed.2010 and based on the development of different thermal and structural as well as global and local finite element models of the system.

[Fusion for Energy ] F4E-0503-03-01-03, "Design of the Transition Piece and of the Reinforced Concrete Crown supporting the Tokamak Machine" (2016-Ongoing): Derivation of the construction design for the Steel Transition Piece (STP) supporting the ITER Tokamak machine and preparation of the structural integrity assessment of the steel pieces and reinforced concrete volume around them.

[ITER Organization] IO/CT/16/4300001330, "Vacuum Vessel Pressure Suppression System (VVPSS) Analysis and Structural Integrity Assessment" (2016-Ongoing): Linear and non-linear relief line thermo-hydraulic analysis, tank sloshing analysis, structural assessment of VVPSS Tanks and VVPSS Relief line. Proposal of design alternatives.

[Fusion for Energy ] F4E-0503-03-01-01, "Design of the cargo lift to cask interface and structural and dynamic justification" (2015-2016): Design and analysis of the cask/cargo-lift interface, including: review of constraints, definition of the design space and generation of the design basis;

search of conceptual solutions for the interface; simplified seismic analyses for the preliminary sizing; proposal for the interface design; and seismic analysis of the cargo-lift together with the cask (detailed FE model in ANSYS; static, modal and seismic analyses).

[Fusion for Energy ] F4E-0503-01-01-01 & F4E-0503-01-01-02, "Seismic analysis of the Tokamak Complex and Tokamak machine and derivation of FRS" (2015-2016): Development of an updated set of seismic analyses on the final version of the Tokamak Complex, including: a complete review of the FE model of the Tokamak Complex developed by the Architect Engineer; the determination of the FRS and its validation by means of a complementary analysis based on an independent and alternative FE model of the building built by ESTEYCO from scratch with the machine embedded to it; a specific updated assessment of the seismic response of the Tokamak machine and the resulting interface forces.

[ITER Organization] IO/CT/4300001207, "Pre & Post-Test Predictions of the CSB Scaled Model Tests by Finite Element Non-Linear Analyses" (2015-2016): The objectives were: to develop a virtual tool which could anticipate/analyze problems prior the start/during the test campaign as well as support the analysis of the results obtained from the physical tests; to have a tuned and validated simulation tool of the CSBs benchmarked against experimental results, which can be used in the future within the ITER project.

[ITER Organization] IO/CT/4300001137, "Nonlinear Finite Element Analysis of Cryostat Support Bearings for Design Validation – Elastic and elasto-plastic assessment based on local submodelling" (2015-2016): Advanced structural analyses based on linear and non-linear elasto-plastic FE models and on the corresponding integrity assessment according to RCC-MR design rules in order to provide the justification to either confirm the adequacy of the steel grade selected for the CSBs base material or promote a change in this material selection.

**R&D projets:**

[CIEMAT & EUROfusion] Exp. 264168, "Support activities for the mechanical design of the DCLL (Dual Coolant Lithium-Lead) DEMO breeder blanket" (2015-2016).

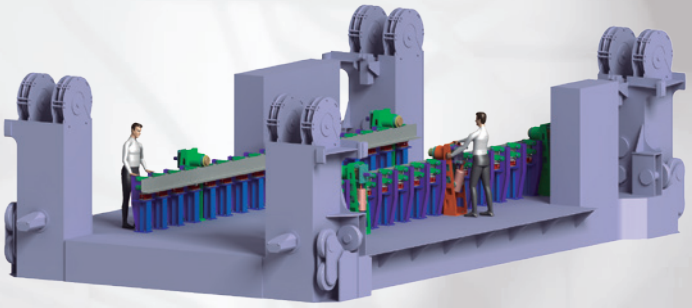
[Fusion for Energy ] F4E-0503-03-01-01, "Participation in the OECD/NEA MECOS (Metallic Component Margins under High Seismic Load) International benchmark" (2015-2016).

**Markets:**

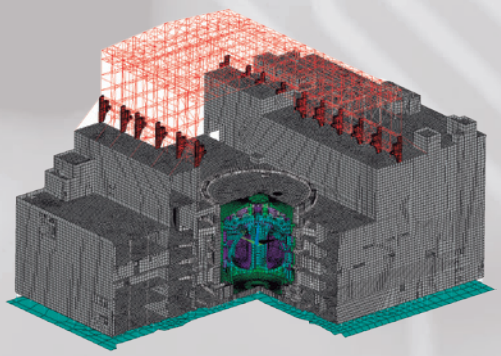
Nuclear / Aeronautics / Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9100, ISO 14001



Design of the ITER Cargo Lift-to-Cask mechanical interface



Dynamic FEM of the ITER Tokamak Complex and Tokamak machine assembly

ferrovial


| | |
|---|---|
| **COMPANY NAME** | **FERROVIAL** |
| **ADDRESS** | **Ribera del Loira, 42, 28042 Madrid, Spain** |
| **WEB** | **www.ferrovial.com** |
| **TURNOVER** | **9.701 M€ in year 2015** |
| **EMPLOYEES** | **74,032 in year 2015** |
| **CONTACT PERSON** | **Manuel Manjón** |
| | **POSITION Construction Contracting Department** |
| | **PHONE +34 932 403 030** |
| | **EMAIL mmanjon@ferrovial.com** |
| | **SME No** |


### Company activities and skills:

Ferrovial is one of the world's leading infrastructure operators and municipal services companies, committed to developing sustainable solutions. The company has more than 74.000 employees and a presence in over 15 countries. The company's activity is carried out through four business lines: Construction, Industry, Services, Airports and Toll Roads

Ferrovial Agroman is the construction branch of the Ferrovial Group. It is internationally renowned for its design capacity and construction of exceptional projects of all kinds and it has a stable presence in diverse strategic markets, with an amount of turnover 4,287 M€ in year 2015 representing 44% of the whole Group.

Ferrovial Agroman is currently working on the ITER project contributing with its expertise in construction of large industrial facilities, as well as a deep knowledge of a wide range of civil works and M&E activities.

The company has also been involved in all major nuclear projects in Spain.

Its extensive experience is endorsed by having implemented more than 520 km of tunnels, 19,800 km of roads (including 4,300 km of highways) and 5,100 km of railroad lines (including 860 km of high-speed lines). It also stands out for its commitment to safety and environment.

### Large scientific facilities and national research facilities contracts:

CONTRACTS AWARDED TO FERROVIAL AGROMAN,S.A in the ITER Complex Caradache.

F4E - (TB06) HV Electrical Equipment - 2014

Design, supply, installation, commissioning, testing and maintenance of electrical equipment (PBS43 and PBS41.PP) and design, construction, commissioning, testing and maintenance of buildings and associated infrastructure (F4E-OPE-428).

F4E - (TB05) Design & Build Buildings 32,33 and 38 - 2013

Includes the buildings 32 and 33 of 4.875 m2 each, where will be done the conversion of power supply for the energization of the magnets, and the building 38 which has an area of 778 m2 and will be where reactive power will be controlled. The main feature of these buildings is the existence of electromagnetic fields generated by the equipment included and this requires avoiding the use of ferrous materials in the range of the fields, and forcing to use concrete reinforced with fibers for some of the pillars, building walls and slabs of concrete of pits. The foundation will be underground to avoid being affected by electromagnetic fields.

F4E - (TB07) Design & Build Buildings 64,67,68 and 69 - 2013

Includes the Building 67 of 7.740 m2 which corresponds with storage tanks of hot and cold water for cooling towers, the building 68 of 416 m2 for water pumping station, the building 69 of 1.500 m2 for heat exchangers and the building 64 of 540 m2 for water treatment.

In this contract, the building 67 is the work most important because its scope includes design, civil works and the installations, highlighting the foundations, structure and waterproofing of "hot & Cold basin"

F4E - (TB03) Civil Engineering & Finishing Works - 2012

Includes a total of 11 buildings, storage areas, and bridges between buildings, highlighting among them the Tokamak complex (building 11-Tokamak, 14-Tritium and 74-Diagnostic) where will be located the reactor and 13-assembly building where will take place the previous assembly of elements.

Ferrovial was a semi-finalist in the tender of:

F4E - (TB04) Hvac, Electrical, I&C , Handling equipment, Liquid Networks.- 2013

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

ISO 9100, ISO 14001, ISO 50001, Certificate of Quality System for Building and civil works services at the sites of the Spanish nuclear power plants. (UNE 73401:1995)

Aerial view ITER

Zenithal view ITER

| | |
|---|---|
| **COMPANY NAME** | **FRACTAL S.L.N.E. (GARCIA VARGAS MARIA LUISA 000852081X S.L.N.E.)** |
| **ADDRESS** | **C/ Tulipán 2, portal 13, 1A. E-28231 Las Rozas de Madrid (Madrid)** |
| **WEB** | **www.fractal-es.com** |
| **TURNOVER** | **1,136,000 in year 2015** |
| **EMPLOYEES** | **7 in year 2016** |
| **CONTACT PERSON** | **María Luisa García Vargas** |
| | **POSITION General Manager** |
| | **PHONE +34 916 379 640 / +34 630 737 981** |
| | **EMAIL marisa.garcia@fractal-es.com** |
| | **SME Yes** |

**Company activities and skills:**

FRACTAL SLNE is a private company belonging to the technological activities sector. FRACTAL was founded in August 2005, being now 11 years old. We provide consultancy services in different engineering areas. Our main goals are to consolidate ourselves as a company specialized in engineering services for scientific projects, to focus our services mainly to the research and operation centres and universities, which sometimes need additional engineering or managing manpower; and to collaborate with other companies, universities and research centres in Research & Development Projects for scientific applications.

Our main area of expertise is the development of professional astronomical instrumentation and software. Most of FRACTAL's consultants worked at GRANTECAN Company, in charge of the development of the 10-m telescope, the GTC. Most of the projects developed by our company have been focused in the development and/or optimization of instruments and, even before, most of the FRACTAL people were part of the system engineering, instrumentation and software Groups at the GTC 10-m telescope. FRACTAL's General Manager was for more than 9 years the Head of the Instrumentation Group at the GTC Project Office. FRACTAL people mainly come from three areas of expertise: (1) Astronomical Instrumentation (including Optics, Mechanics, Electronics, Detectors, Cryogenics, etc.); (2) Control and Software Development (Real Time Control, including astronomical software for telescope operations, active Optics loops, mechanisms control, Data bases and Data management and processing) and (3) Management and System Engineering.

This specific expertise has allowed us to participate in large project's developments, like the instrumentation for the GTC 10-m telescope, as well as international projects, such as CARMENES (for the 3.5m telescope at Calar Alto), MEGARA (for the 10 m GTC), OCTOCAM (for the 8.2m Gemini Telescopes), the HEXA 6.5 m telescope, the TSPM 6.5 m telescope and the instrumentation for the giant 42-m diameter ELT segmented telescope as well in the design and implementation of complete S/W telescope systems.

Starting from the basic scientific requirements, we can produce feasibility studies, designs (at different levels) or even the development of the whole scientific project. In particular, FRACTAL we do the specification, design, acquisition and tests of collimators, cameras, filters, prisms, grisms, and Volume holographic gratings (VPHs) (especially for Astronomy applications) and we develop optical systems for measuring purposes. We have performed the optical design of several ground based instruments and telescopes, such as TSPM (6.5 m telescope to be built at San Pedro Mártir Observatory in Baja California, Mexico), HEXA (6.5 m telescope that was

proposed for Calar Alto observatory), ACTUEL (2.5 m telescope for Javalambre observatory), NAHUAL (an echelle high resolution spectrograph in the near IR for the GTC), OCTOCAM (8-channel mid-resolution spectrograph for Gemini Observatory), etc. Additionally, we have performed the complete development (from design to manufacturing, integration and verification) of several instruments, such as MEGARA (an IFU and multiobject spectrograph that shall be installed in 2017 in the GTC 10m telescope at the Observatorio Roque de los Muchachos, La Palma, Spain), a coronagraph for CAHA, ARES (a fibre-feed spectrograph for the IEEC) and PAU (a wide FOV imager for the 4.2 m William Herschel Telescope at La Palma).

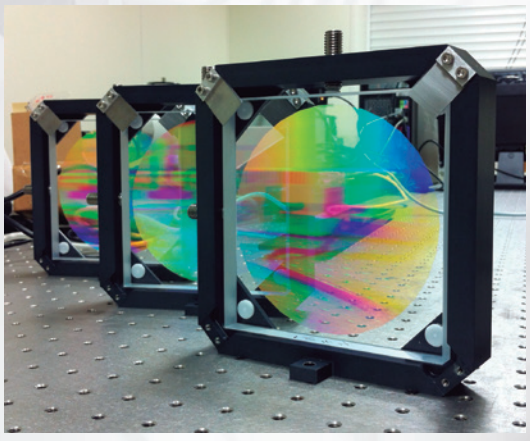
FRACTAL also provides services of project management and System Engineering for scientific projects. As an example, we can mention that FRACTAL provided the project management and system engineering services of CARMENES, an exoplanet searcher spectrograph built for the 3.5m telescope at the Calar Alto Observatory by a consortium formed by 11 German and Spanish institutions. The project had a fixed deadline and demanded a strong system engineering and management effort. CARMENES was successfully commissioned at the required date and is currently in operation. Currently, we are providing these services for MEGARA (described in the previous paragraph) and for TSPM, which is a 6.5 m Telescope to be built at San Pedro Mártir Observatory (Baja California, Mexico). This project is an association of two Mexican Research institutions (IA-UNAM in Mexico DF and INAOE in Puebla) in partnership with the Smithsonian Astrophysical Observatory and the University of Arizona's Department of Astronomy and Steward Observatory in the United States of America.

FRACTAL signed a Non-exclusive know-how license agreement on the use of the ESO Continuous flow cryostat technology with ESO in June 2015 (the public press release raised by ESO for announcing this agreement can be found at the following link: https://www.eso.org/public/announcements/ann15041/ ).

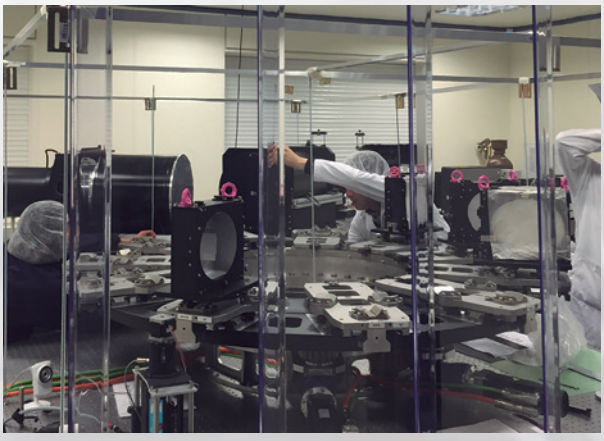
**Markets:**

Astronomy and Astrophysics / Management / System Engineering and Software

**Quality certifications, nuclear qualifications:**



Volume Phase Holographic gratings for ARES spectrograph at Joan Or¢ telescope(customer IEEC, Barcelona)



MEGARA spectrograph for the GTC 10m telescope during the assembly at laboratory in Universidad Complutense (customer UCM, Madrid)

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|---|---|
| **COMPANY NAME** | **FUS_ALIANZ® SCIENCE, ENGINEERING AND CONSULTING** |
| **ADDRESS** | **Nord 19, Atico, El Vendrell (Tarragona), Spain** |
| **WEB** | **www.fus-alianz.eu** |
| **TURNOVER** | **< 500 k€ in year 2015** |
| **EMPLOYEES** | **4 (*) in year 2016** |
| **CONTACT PERSON** | **Luis A. Sedano** |
| | **POSITION Innovation Dept., Director** |
| | **PHONE +34 655 851 520** |
| | **EMAIL ls@fus-alianz.eu** |
| | **SME Yes** |

(*) [1 + 3 Trade + More Than 8 Ext. Colabs. ]

### Company activities and skills:

FUS_ALIANZ® is a young Spanish Technology-based small company. F_A® starts activity by 2015 as a highly qualified R&D and specialized provider of Technology Services. Our costumer are typically large and small Companies, R&D Technology Centers and Universities. Such initial service profiling is overlaps the F_A® own engineering and R&D activities. Specifically, F_A® engineering and R&D is targeting at present a wide set of products and developments in different sectors of Industry of Science business. FUS_ALIANZ® is, at present, pushing developments towards: (A) the industrial scaled provisions of base-of-design materials with Nuclear Quality Assurance: as (1) special structural alloys produced by new manufacturing powder metallurgy routes; and (2) industrial production of fusion functional materials as lead-lithium eutectics and lithium-ceramics; (B) Supercomputing platforms for advanced nuclear design and predictive nuclear systems modeling software; (C) New nuclear active diagnostics sensor concepts with special intensification in tritium in nuclear effluents.

### Large scientific facilities and national research facilities contracts:

The background of FUS_ALIANZ® professionals´ in the Industry of Science market has been built for decades through collaborations among a large set of EU National Institutions and companies worldwide. Specific focuses of the Company activities within the Industry of Science area are devoted to European Spallation Source (ESS-Bilbao) and Nuclear Fusion activities (ITER and beyond).

### R&D projets:

- Development of a R&D Plan for nuclear instrumentation focusing on ITER TBM components. contractor: IQS (Inst. Químic de Sarrià) (2011).
- Coupled analysis in spallation target for the European Spalation Source- Bilbao, 2012. contractor: ESS-Bilbao. Sector: Neutron Source.
- QA and development of design predictive simulation tools for internal components and systems in ITER. contractor: UPC (2012). Sector: nuclear fusion.
- Towards Integrated computational platform development for nuclear components design analysis. contractor: Génie et Conseils (2012). Sector: nuclear fusion.
- Development of steady-state tritium predictive simulation tools in HYSIS /Aspen+ commercial software. contractor: inprocess consulting and technology group (2013) as support to a PI+D awarded by CDTI. Sector: nuclear fusion.
- ITTSIM2016® Project. Development of dynamic tritium predictive simulation tools in HYSIS

/Aspen+. contractor: inprocess consulting and technology group (2016) as support to a PI+D awarded by CDTI. Sector: nuclear fusion.

- PROTOCODAC® Project (COntrol Data Access and Communication prototyping for tritium mass-balance dynamic control demonstration in ITER (2014) as support to a PI+D awarded by CDTI. contractor: proconsystems s.a., Sector: nuclear fusion.

FUS_ALIANZ® OWN R&D PROJECTS (NUCLEAR FUSION SECTOR)

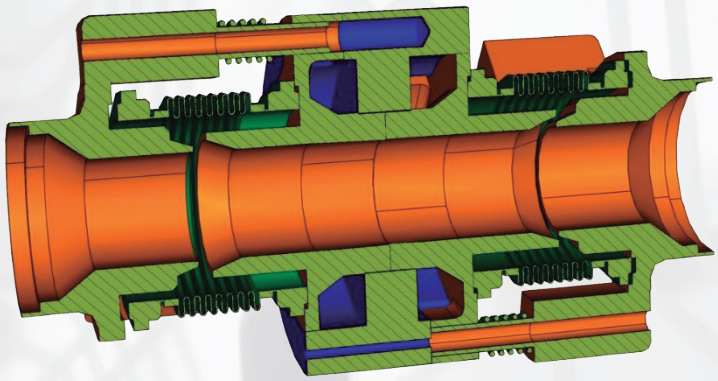
- EUTECTICS®: Industrial production of LLE under nuclear QA standard
- TSENSORS®: Active sensing of tritium concentration in nuclear effluents.

**Markets:**

Nuclear / Space / Energy / Life Sciencies, Primary Resources

**Quality certifications, nuclear qualifications:**

Procedures started for ISO9001, 14025



Design and detailed engineered double pipe connector for fast remote handling

**COMPANY NAME** GMV
**ADDRESS** calle Isaac Newton 11, Parque Tecnológico de Madrid, 28760 Tres Cantos (Madrid)
**WEB** www.gmv.com
**TURNOVER** 140M€ in year 2016
**EMPLOYEES** 1,500 in year 2016
**CONTACT PERSON** Juan Carlos Llorente
**POSITION** Big Science Business Development
**PHONE** +34 918 072 100
**EMAIL** jcllorente@gmv.com
**SME** Yes

### Company activities and skills:

GMV is a privately owned technological business group with an international presence. Founded in 1984, GMV offers its solutions, services and products in very diverse technologically-advanced sectors, including space, big science and information tecnologies.

With respect to Big Science, GMV's current offer via services contracts or projects includes:

- Development and Implementation of Central/Local/User Control Centers
- Instruments processing, monitoring and control, and calibration
- Data Processing Framework: Automatic Process Execution, Monitoring and Control (Event driven/Data driven), Multi-Sensor Processing Environment, Automatic Resources Reallocation, Algorithm Development and Validation, Support Transparent Scalability, Data Fusion and Data Mining, Archive, Catalogue and Dissemination
- Visualization, Validation & Analysis Tools. Simulators for R&D, Analysis, Training and Ops support
- Planning and Scheduling Solutions
- Custom HW/SW Development and Independent Hardware/Software Verification
- Specialized Engineering Services, including Project Management Support and System Integration, Verification & Qualification and RAMS Analysis
- Autonomous robotics solutions
- Physical Security Solutions, Cybersecurity Solutions and 24x7 Services

### Large scientific facilities and national research facilities contracts:

[ESA/Airbus] Scatterometer Ground Processor Simulator & Prototype Tools in MetOp-SG (2016)

[JAEA] Engineering Support for IFMIF/LIPAc Control System Integration (2016)

[Eumetsat] EPS-SG Mission Control and Operations Support (2016)

[ESA] Design of the Framework Planning System for ESA's Science Missions (2016)

[ITER Org] NDS Core Software Support for CODAC Core System (2016)

[ITER Org] Remote Handling Engineering Support, in consortium (2015)

[ESA] LISA Pathfinder (gravitational waves) Science Data Management Support (2015)

[ESA] SWARM (magnetic measurements) System-Performance Simulator / Operational Instrument Data Processor (2015)

[ITER Org] Service Contract for Design, Manufacture, Qualification and Installation of the Nuclear Safety Control System, as named subcontrator (2014)

[ESA] GAIA Central Check Out System (2012)

[ESA/TAS-F] SENTINEL 2 Instrument Processing Facility (2012)

[ESA] SWARM L2 CAT2 Operational Processors (2011)

[Eumetsat/UCM] SENTINEL 3 OLCI Electronic Control Unit (2011)

[UCM] Cherenkov Telescope Array RAMS Analysis (2010)

[ESA] EarthCare (CLoud, Aerosol and Radiation Assessment) Ground Processor (2010)

[UCM] GTC-MEGARA Instrument Software Development Plan (2009)

[CDTI] Ground Segment Design for the World Space Observatory Ultraviolet Camera (2007)

[IAA/CNES] CoRoT Mission Center (2004)

[ESA] Assembly, Integration and Testing of the ALOS Multi Mission Master Catalogue (2003)

[GTC] Development of the Image Processing System for OSIRIS Instrument (2002)

[ESA] GAIA Mission Data Access & Analysis Study (2001)

[ESA] Herschel & Planck System/Scientific Databases (2000)

**R&D projets:**

CDTI/CIEN: Accelerators and Associated Technologies for Big Scientific Facilities (2017)

EC: Pre-operational validation of security services (2013)

EC: Development of new operational service capabilities with advanced data fusion (2011)

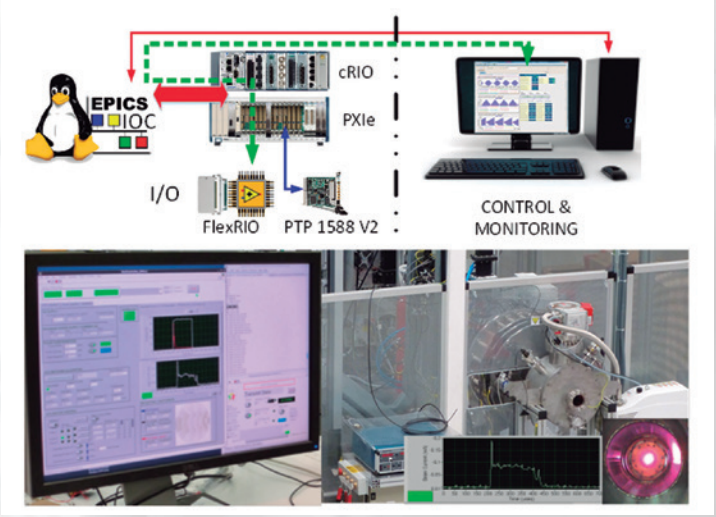
CDTI: SPECTRO3D Generic Processing Framework for 3D Spectroscopy (2010)

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy / Oil & gas/ ITC

**Quality certifications, nuclear qualifications:**

ISO 9100, ISO 14001, CMMI Level 5, UNE-EN 9100, PECAL/AQAP 2110-2210-2310, UNE-ISO/IEC 20000-1, UNE-ISO/IEC 27001, ISO 22301, UNE 166002, NRTL-C/US, UN/ECE N. 10




Instrumentation and Control for Large Scientific Facilities


**COMPANY NAME** GTD SISTEMAS DE INFORMACIÓN SAU
**ADDRESS** Garcia I Faria, 17 – E08005 Barcelona
**WEB** www.gtd.eu
**TURNOVER** 16,35M€ in year 2015
**EMPLOYEES** 142 in year 2015
**CONTACT PERSON** F. Javier Varas
**POSITION** COO Science & Energy
**PHONE** +34 934 939 300
**EMAIL** javier.varas@gtd.eu
**SME** Yes


### Company activities and skills:

GTD is a global technology company committed with the Design, Integration and Operation of high-value, complex, "mission-critical" Applications and Systems all over the world. Excellence in securing performance, availability and robustness makes GTD the ideal choice for strategic projects. The main activity sectors of GTD are Space, Aeronautics, Defense&Security, Logistics&Transport, Energy and Complex Utilities (like Telescopes, High Energy Physics laboratories and Fusion Reactors).

### Large scientific facilities and national research facilities contracts:

| | |
|---|---|
| F4E (2017) | Design and Implementation of the Mini CODAC - Development for B61, B13-17, B32, B33, B36 and B38 as well as PBS65 services (2017) |
| CNES/ASL | Famille des Bancs de contrôle Ariane 6 (2016) |
| FERROVIAL | (>ITER) Instrumentation and Control of several ITER Buildings: B32, B33, B38, … (2016) |
| ESS (2016) | Framework Consultancy Agreement concerning Electrical Engineering, Instrumentation and Control |
| OMEGA | (> ITER) Instrumentation and Control of several ITER Buildings: B61, B13, B17, … (2016) |
| CNES/ASL | Familie des bancs de contrôle Ariane 6 (2016) |
| AFW (2016) | (>F4E-OFC-620) Provision of engineering support for design and qualification of nuclear safety I&C |
| F4E (2016) | Instrumentation, Control & (Fast) Protection Systems for European Gyrotron test facility and ECT - FALCON |
| F4E (2016) | Development of HMI and PLC interface (PSH) for LN2 plant |
| F4E (2016) | Design and implementation of the Alarm Survey System extension. |
| F4E (2015) | Preliminary Design of the Instrumentation and Control system for the HCLL PbLi Loop. |
| F4E (2015) | Remote Handling: GENROBOT Project development and validation. |
| F4E (2015) | Preliminary design of the Magnetics Diagnostic Plant System Controller Hardware and Software |

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|---|---|
| F4E (2015) | Integration of Buildings Equipment into ITER CODAC Central System |
| F4E (2014) | Fast Plant Controller Prototype |
| F4E (2014) | Advanced Conceptual design of the Magnetic Diagnostic plant system controller hardware and software |
| F4E (2014) | Design of the integration of European Cryoplant into ITER CODAC |
| CNES (2013) | Renouvellement des Postes Opérateurs CCO CCX |
| ADS (2013) | Système d'ACQuisition des Mesures SACQM-E |
| F4E (2013) | Magnetics Diagnostics: Requirements consolidation, preparation and planning of the plant system design |
| CNES (2013) | GST3 (2013) |

Before 2013, several contracts with CERN (Control and Supervision of the LHC Cryogenics, Control & Interlock Systems for the SPS Main Power Converters, Design of the Common Control Room, …), CELLS ALBA Synchrotron (Control and Supervision of the Cooling System), ESRF, ILL,

Also, continuously working for CNES since 1995. Involved in Ariane5, SOYUZ, … Working in projects like SCET-M, the CSG, SNCC UPG, SOYOUZ CFS, Dispositif de Securité Manuel Ariane5, Controle Commande Servitudes SOYUZ, …

**R&D projets:**

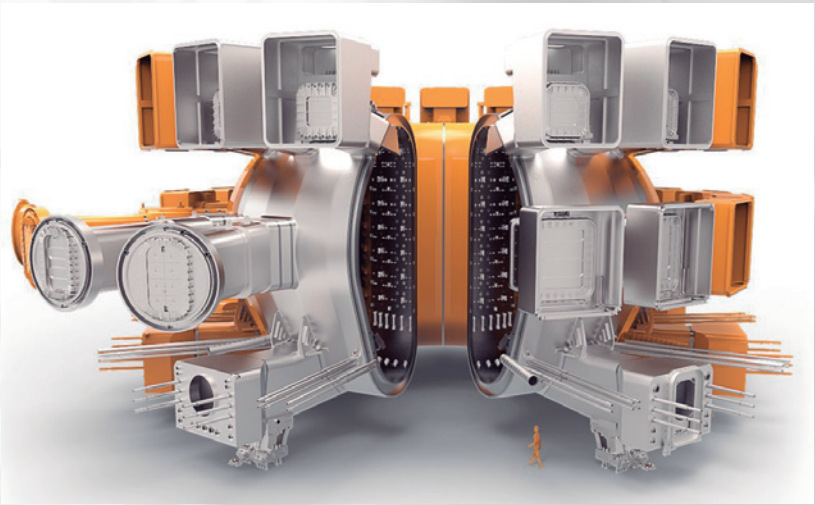
| | | |
|---|---|---|
| CBM4ALBA(2010-2013) | IDC-20101078 | Condition Based Maintenance CBM in Research Facilities (ALBA Synchrotron) |
| CriticalLogic(2016-2017) | IDI-20160121 | ULTRAFAST FUNCTIONAL SAFETY PROTECTION SYSTEM WITH HIGH RELIABILITY AND AVAILABILITY |

**Markets:**

Defense / Naval / Aeronautics / Space / Energy / Other: Defense&Security, Logistics&Transportation, Science (High Energy Physics' laboratories, Fusion Reactors, Telescopes…)

**Quality certifications, nuclear qualifications:**

ISO 9100, EN9100, AQAP2110, 2210 and CMMI CL



Iter vacuum vessel - (C) ITER Organization

| | |
|---|---|
| **COMPANY NAME** | **HEDISA, S.A.U** |
| **ADDRESS** | **León-Villarroañe Road, Km 6,5. 24199 Marialba De La Ribera (León), Spain** |
| **WEB** | **www.grupohedisa.com** |
| **TURNOVER** | **4,454,528.37 € in year 2016** |
| **EMPLOYEES** | **38 in year 2017** |
| **CONTACT PERSON** | **Lorenzo Casas** |
| | **POSITION Dr. Industrial Engineer** |
| | **PHONE +34 987 849 690** |
| | **EMAIL lcasas@grupohedisa.com** |
| | **SME Yes** |

**Company activities and skills:**

Pioneer in the development, manufacture and sale of diamond tools and machinery, GRUPO HEDISA is represented worldwide and sells its products and providing services in over 30 countries.

Hedisa make the Grupo a benchmark in the field of diamond tools, combining the experience and both quality and service. The diamond wire for granite and marble quarries as well as the diamond wire for multiwire machines and segments and gangsaw blades for cutting marble are the most outstanding products.

The long time experience in the production such kind of tools and the necessary equipment have given to Hedisa the ability and know how in the fields of powder metallurgy, heat treatments and surface treatments.

- Cold pressing
- Continuous furnaces
- Controlled atmosphere furnaces
- Isostatic pressing (H.I.P.)

In addition to that, experience in other production fields given by other activities carried out by the group, allow Hedisa to have a global view of any R&D project, not only from the point of view of design but also from the point of view of manufacture:

- Engineering
- Mechano-welded structures
- General machining
- High precision machining
- Metrology
- Toolings
- Comprehensive solutions

**R&D projets:**

- 2015:FUSION TECHNOLOGIES Advanced manufacturing technologies in the Industry of Science. Application in the field of Fusion

- 2012: OPTIMIZATION OF THE INJECTION SYSTEM IN A HOT CHAMBER MOULD
- 2010: OPTIMIZATION OF THE RUBBERING PROCESS
- 2010: STUDY AND DEVELOPMENT OF A NEW DIAMOND WIRE FOR MULTIWIRE SYSTEMS
- 2009: METAL CERAMIC MATRIX COMPOSED MATERIALS MATERIALS WITH HIGH DIAMOND CONCENTRATION
- 2008: DEVELOPMENT OF TOOLS FOR POLISHING NATURAL STONE
- 2006: DEVELOPMENT OF THE SINTER-HIP PROCCESS AND / OR SINTER-HIP OF DIAMOND BEADS FOR CUTTING NATURAL STONE

**Markets:**

Production and sale diamond tool

**Quality certifications, nuclear qualifications:**

ISO 9100, UNE 166002

Hedisa Headquarters

| | |
|---|---|
| **COMPANY NAME** | **HILFA** |
| **ADDRESS** | **Barrio Arteagoiti, 8 - 48970 Basauri - Vizcaya (Spain)** |
| **WEB** | **www.hilfa.com** |
| **TURNOVER** | **3,750,000 € in year 2016** |
| **EMPLOYEES** | **45 in year 2016** |
| **CONTACT PERSON** | **Igor Zarandona** |
| | **POSITION Managing Director** |
| | **PHONE +34 690 933 823** |
| | **EMAIL izarandona@hilfa.com** |
| | **SME Yes** |

**Company activities and skills:**

- Manufacturing of Telescope Domo.
- Company founded in 1952, dedicated to the manufacturing of heavy mechanical equipments that include welding, machining and final integration(assembly).
- Precision Machining.

**Large scientific facilities and national research facilities contracts:**

- ATST ( Idom): Manufacturing of Domo. 2012-2013
- GTC: Manufacturing of boggies. 2016
- CERN 2015
- ITER: Toroidal Field Coils Bench. 2014-2015

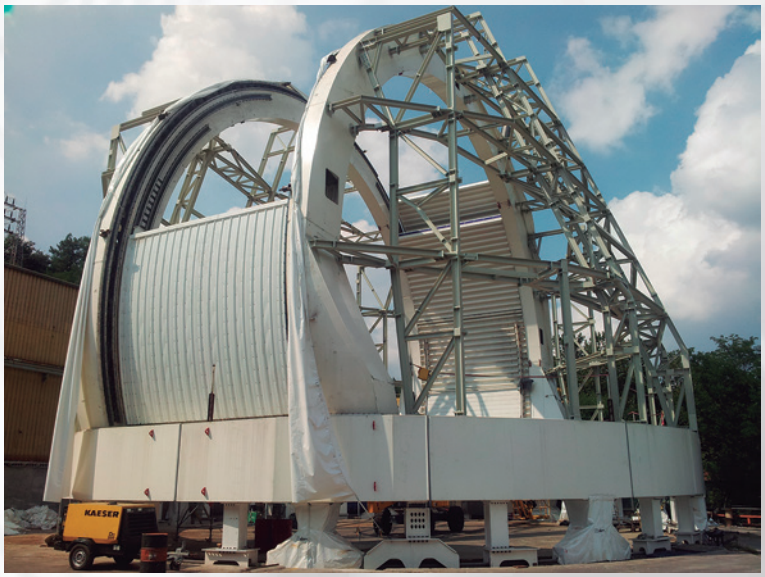
**Markets:**

Nuclear / Automotive / Aeronautics / Space / Energy / Oil&gas / Machine Tool Industry

**Quality certifications, nuclear qualifications:**

ASME, ISO 9001

Manufacturing of Domo




Manufacturing of Domo


**COMPANY NAME** IBERDROLA INGENIERIA Y CONSTRUCCION SAU
**ADDRESS** Avda. Manoteras, 20. 28050 Madrid
**WEB** www.iberdrolaingenieria.com
**TURNOVER** 681 M€ in year 2016
**EMPLOYEES** 1,963 in year 2016
**CONTACT PERSON** Joaquín González
**POSITION** Director of Bids and Contracts Management
**PHONE** +34 913 833 180
**EMAIL** jgk@iberdrola.es
**SME** No

## Company activities and skills:

Founded in 1995, IBERDROLA Ingeniería y Construcción SAU is the IBERDROLA Group Company that has assumed responsibility for all the Group's engineering activities and consolidated its position as the unquestioned leader in electricity generation, distribution and control facilities. We offer a range of services that includes project management throughout every phase, engineering, supply, construction and start-up, turnkey projects and operational support.

Thanks to the efforts and commitment of a highly qualified team of professionals, we have differentiated our position in the marketplace by providing quality services and integrated solutions across all sectors of the energy business. We can now say that we have broad experience both nationally and internationally, with projects in more than 30 countries and a firm commitment to continuing growth.

The evaluation report in which IBERDROLA Ingeniería y Construcción SAU was named European leader in Excellence underlined, among others, the following strengths:

- The Management's commitment to excellence and its promotion of participation
- The integration of quality and environmental systems in the Company's projects
- Improvements in the monitoring and following up of projects
- High levels of awareness in health and safety and environmental issues
- The new projects implemented to improve process efficiency
- The measures taken to extend best practices: experience-sharing and lessons-learned workshops

The Nuclear Division offers experience in full scope engineering for PWR (Westinghouse and KWU) and BWR (General Electric) plants and considerable expertise for other designs as VVER and CANDU reactors. It renders a wide range of services to nuclear facilities, form conceptual and basic engineering, including systems definition and design, to operational support.

Nuclear Division team provides nuclear experience and capabilities in the following areas: Project Management, Mechanical and Structural Engineering, Electrical and Instrumentation and Control Engineering, Safety Engineering and Licensing, Nuclear Fuel Engineering, Radioactive Waste Management and Decommissioning and On-Site Project Engineering

## Large scientific facilities and national research facilities contracts:

F4E, ITER: Design activities of the Cooling Plant for the 4 Electron Cyclotron Upper Launchers (2015-on going) : Design of the cooling water distribution systems for the four Electron Cyclotron

Upper Launchers, Equatorial Launcher and EC Gyrotrons & Power Supplies.

F4E, ITER: Manufacturing of a Full-scale Prototype of the ITER NHF First Wall (FW) Panel (2014 – on going): These panels comprise a stainless steel and CuCrZr copper alloy heatsink covered with beryllium tiles, designed to meet a complex set of requirements which include thermal and mechanical loads. This prototype will qualify series production of these panels.

ITER: Design and Engineering of the ITER Central Interlock System(CIS) (2012-on going): Engineering support for the design of the ITER Interlock Control System, in charge of the protection of the Tokamak integrity, maximizing scientific operation time; but at the same time anticipating and test the interlock solutions for future industrial fusion reactors.

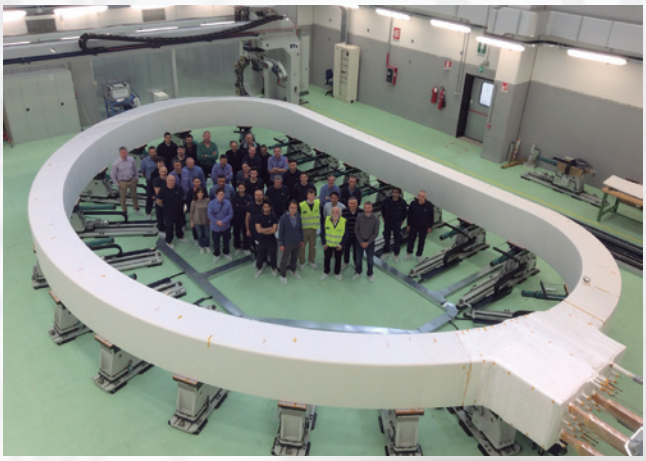
F4E, ITER: Supply contract for the Manufacturing of 10 Toroidal Field Coils Winding Packs (2010-on going). The Winding Packs (WP) that belongs to the ITER fusion magnet system which consists of 18 “D” shaped coils. Each WP is measuring approximately 14 X 9 m and weighing 110 tons. In order to complete each WP is has been required to develop novel and sophisticated tooling to be constructed on a large scale.

**Markets:**

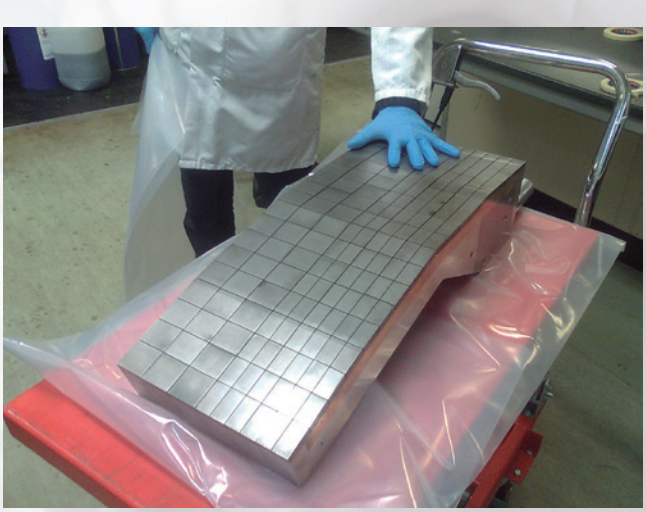
Nuclear / Energy

**Quality certifications, nuclear qualifications:**

ASME, ISO 9001, ISO14001, Innovation certificate UNE 166002, OSHAS 18001, Homologation by Supplier Evaluation Group



First Winding Pack with Representatives of all parties involved.



Finished First Wall Panel Semi Prototype

**COMPANY NAME** INGENIERÍA Y DISEÑO EUROPEO S.A. (IDESA)
**ADDRESS** Parque Científico Tecnológico de Gijón C/Profesor Potter nº 105 - 33203 Gijón/Asturias/Spain
**WEB** www.idesa.net
**TURNOVER** 73 M€ in year 2015
**EMPLOYEES** 400 in year 2015
**CONTACT PERSON** Adrián Arboleya
**POSITION** Innovation Manager
**PHONE** +34 985 175 705
**EMAIL** adrian.arboleya@idesa.net
**SME** No

## Company activities and skills:

Founded in 1993, IDESA has grown to currently become one of the most recognized and respected companies in the design, fabrication and supply of static and modular equipment worldwide.

IDESA is an engineering and manufacturing company, one of the leading suppliers of large manufactured equipment such as Coke Drums, Vacuum Columns, Fractionators, Reactors; as well as all types of Vessels and Drums.

With 48'000 $m^2$ of indoors manufacturing areas and its privilege location close to the Port of Avilés, IDESA meet any demand from the Oil&Gas and Offshore Wind Energy sectors.

The Company has long experience and reputation in the high quality demanding Oil&Gas and Marine Energy sectors, so its processes and quality procedures are the most adequate to operate in Large Scientific Facilities and National Research Facilites sector.

Since May 2014, Idesa is part of GRUPO DANIEL ALONSO (GDA).

## Large scientific facilities and national research facilities contracts:

A) MANUFACTURING OF CRYOSTAT BASE FOR JT60-SA PROJECT

In the context of JT-60Sa Project developed in Naka (Japan), IDESA was awarded with the contract for the fabrication and shop assembly of the Cryostat Base. This structure, weighing around 300 ton and with a diameter of 12 meters, is an assembly comprising seven big stainless steel sectors, that are to be bolted together during final assembly in Japn There are three "lower level" 120º sectors (the Lower Structure sectors), and three "upper level" 120º sectors (the Double Ring sectors) resting on the Lower Structure Sectors. The seventh piece is the Cylindrical Shell, located inside the DR sectors, and resting onto the LS sectors. This solution was adopted in view of the dimensional restrictions to the final land transport between Hitachi Port and final destination at Naka site.

The thicknesses of the structure are mostly betwwen 80 and 100 mm. Most of welds are butt or corner welds, full penetration type, so a great amount of weldment is involved. Thus, the control of the distorsion produced during welind activities was essential to fabricate a welded structure that at a later stage can be machined within the required tolerances.

The contract included a shop assembly of the seven sectors to validate the fabrication and the final dimensions of each of the sectors.

The material was delivered at Avilés Port (Spain) in November, 2012. After a two-months travel, it arrived at Hitachi Port in Japan by middle January, 2013. The final assembly at Naka was done.

B) REVISION AND UPDATE OF SDC-IC CODE FOR ITER PROJECT

Several ITER components, referred to as in-vessel Components, are located inside the ITER Vacuum Vessel; they will be subjected to special operating and enviromental conditions (neutron radiation, high heat fluxes, electromagnetic forces, etc.). The effects of irradiation on them, including embrittlement, swelling and creep, were not addressed in the existing commercial codes. These conditions are different from conditions in fission reactors and create challenging issues related to the design of these components. For this reason the Structural Design Criteria for ITER- In-vessel Components (SDC-IC) was developed in 2001 for design purposes. In 2008 some issues were identified with regard to the existing version of SDC-IC.

The Contract was awarded by Fusion For Energy (European Union´s Joint Undertaking for ITER) to the consortia between IDESA and Natec and the tasks covered were:

(a) Modification of design rules, incorporating rules from recently developed codes, and development of specific design rules to cover ITER specific issues and operational conditions

(b) Demonstration of consistency between design rules in SDC-IC and european standards used for manufacturing, in particular EN 13445; identifying areas where consistency is not provided

(c) Assessment of the compliance with the Essential Safety Requirements of the French Regulations (ESP and ESPN)

**R&D projets:**

EU 7th RTD Framework Programme – The HIPERWind Project

*CDTI EEA GRANTS – Joints-Off | Low-Cost and High-Durable Offshore Foundation

*LIFE+ CO2FORMARE | Use of C02 as a subtitute of chlorine-based chemicals used in O&M industrial processes for macrofouling remediation

*RFCS JABACO Project | Development of Modular Steel Jacket for Offshore Windfarms

*RFCS REFOS Project | Life-Cycle Assessment of a Renewable Energy Mult-Purpose Floating Offshore System

**Markets:**

Nuclear / Energy /Oil&gas

**Quality certifications, nuclear qualifications:**

ASME, ISO 9001, ISO 14001, OHSAS 18001 , ISO 3834, EN 1090 , PED MODULES H y H1, PUBLIC REPUBLIC OF CHINA, MANUFACTURE LICENSE OF SPECIAL EQUIPMENT “LEVEL A2” CTR RUSSIAN FEDERATION

Shipment of Flexicoking unit - There are only 7 in the world. IDESA manufactured last 2 units

**COMPANY NAME** IDOM
**ADDRESS** Avda. Zarandoa 23, 48015 Bilbao, Spain
**WEB** www.idom.com/projects/ada/
**TURNOVER** 274 M€ in year 2016
**EMPLOYEES** 2419 in year 2016
**CONTACT PERSON** Amaia Zarraoa Garmendia
**POSITION** Responsible for Strategic Development IDOM ADA
**PHONE** +34 944 797 676
**EMAIL** amaia@idom.com
**SME** No

## Company activities and skills:

IDOM is an international firm specializing in Engineering, Architecture and Consulting. IDOM operates globally in areas such as power generation, oil & gas, renewable and alternative energies, manufacturing industry, civil infrastructures, nuclear plants, large technological and scientific facilities, architecture and unique challenging engineering projects.

IDOM ADA leads the company activity in technologically advanced and challenging projects involving applied mechanics, structural design, electronics & control.

IDOM ADA fully develops INSTRUMENTS AND FACILITIES for astronomers, nuclear and particle physicists, researchers in atomic energy, medicine and others. In these fields, there is always a demand for the most advanced technology and innovative solutions, time and again involving a breakthrough from what was used before. As important as the technical challenge, is the definition and development of the project up to the construction and commissioning of the facilities in time and within budget. And this is our commitment.

## Large scientific facilities and national research facilities contracts:

[VTT/CEA] Design, Manufacturing and Commissioning of Hot Cell Gamma and X-ray (HGXR) Equipment in the ECE Hot Cell JHR (2016-)

[CFHT Corporation] Concept Design of the MSE Telescope Structure (2016-2017)

[VTT/CEA] Design, Manufacturing and Commissioning of two units of Underwater Gamma and X-ray (UGXR) Collimators for JHR (2015-)

[F4E] Integration Design of Diagnostics into ITER Ports (2014-)

[VTT/CEA] Design, Manufacturing and Commissioning of two units of Underwater Gamma and X-ray (UGXR) Benches for JHR (2014-)

[IAC] Design and Fabrication of QUIJOTE CMB Telescopes (2007-2015)

[AURA] DKIST Enclosure Fabrication, Factory Assembly and Testing (2012-2014)

[GTC] Folded Cassegrain Sets (Instrument Rotator + A&G Optomechanics) Design and Fabrication (2010-2012)

[AURA] DKIST Enclosure Design (2010-2012)

[ESO] E-ELT Dome and Foundations Final Design (FEED Study) (2009-2011)

[ESS-Bilbao] High Power Spallation Target Development (2008-2011)

[ESO] E-ELT Dome and Foundations Preliminary Design (2007-2008)

**R&D projets:**

[CDTI – FEDER Innterconecta] ACELTEC Tecnologías de Fabricación de Aceleraciones Lineales Superconductores de Alta Intensidad (2012-2014)

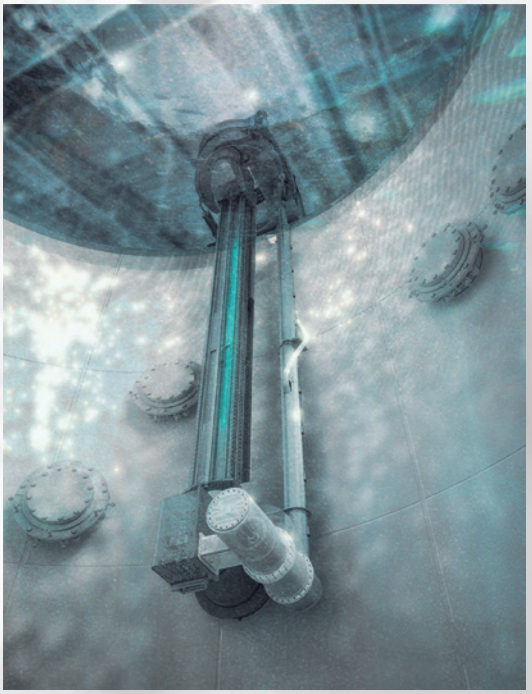
**Markets:**

Nuclear / Space / Energy / Oil&gas / Science

**Quality certifications, nuclear qualifications:**

ASME, RCC-MR, ISO 9001, ISO 14001

Daniel K. Inouye Solar Telescope (DKIST) Enclosure in Maui (Hawai, USA)



Underwater Gamma and X-ray (UGXR) Bench for the Jules Horowitz Reactor (Cadarache, France)


**COMPANY NAME** INDRA SISTEMAS, S.A.
**ADDRESS** Avda Bruselas 35,Alcobendas 28108-Madrid, Spain
**WEB** www.indra.es
**TURNOVER** 2850 M€ in year 2015
**EMPLOYEES** 38658 in year 2015
**CONTACT PERSON** Ana Isabel Gálvez Pérez
**POSITION** Manager
**PHONE** +34 914 809 117
**EMAIL** aigalvez@indra.es
**SME** No


## Company activities and skills:

Our ordinary business contributes to the creation of wealth by generating solutions and services as well as the distinguishing characteristic: innovation.

Indra has always been committed to developing proprietary technologies and solutions with a differential value for the various sectors in which it operates.

Indra has proprietary solutions for all its market segments: Transport & Traffic, Energy and Industry, Public Sector and Healthcare, Financial Services, Security and Defence, and Telecom & Media.

PARTICULAR INDRA SKILLS FOR FUSION PROJETCS

- Energy Technologies: Control technologies (I&C, SCADA, Data Acquisition,…), Metering systems, Modeling & Monitoring applications, Technical consultancy
- Space Technologies: Digital signal processing, Radio frequency, IP protocols and multimedia, Real-time, critical and embedded SW & HW, big DB, …
- Simulators (full scale and compact) & Automatic Test Facilities
- RADAR, RF & Microwave Design, RF Power Modules, SSPAs (Solid State Power Amplifiers, Amplifiers based on solid state technology -LDMOS-),…
- Cross-Sectors Technologies: HW / FW Design, Critical SW Design, Electrical, Mechanical & Test Engineering, Electro-Optics,…

## Large scientific facilities and national research facilities contracts and R&D projects:

CERN: HNSciCloud-Helix Nebula The Science Cloud (2016-2017)

The aim of the project is the establishment of a European hybrid cloud platform, Helix Nebula - the Science Cloud, to support the deployment of high-performance computing and big-data capabilities for scientific research. The scope of the services is broken down into three phases: (1) - Solution design of the Hybrid Cloud Platform, (2) - Prototype implementation of the Hybrid Cloud Platform, (3) - Pilot deployment of the Hybrid Cloud Platform. The present contract is for the execution of Phase 1: Solution design

IO/CT/6-134 “Framework Contract for CODAC Operation Application Engineering Support”:

Framework Contract for the development of CODAC operation applications, inside the CCS environment (CODAC Core). Contract for 5 years, awarded to 2 different consortia, Task Orders assigned under restricted competence. The scope of the services covered in the contract is broken

down into three different lots: (1) - Software development services for supervisor, scheduler and remote participation, (2) - Software development services for PCS, (3) - Software development services for data handling (acquisition, archiving, access).

Involved technologies: Linux, C, C++, Python, ECLIPSE RCP, Web Services, XML, EPICS, MATLAB/ SIMULINK, HDF-5.

F4E-OFC-169 (PS-IC) "FRAMEWORK SERVICE CONTRACT FOR PROVISION OF SYSTEM AND INSTRUMENTATION ENGINEERING SUPPORT":

Tender in 2010-2011. Duration 4 years. Is a Framework Contract for Engineering Support service to F4E in the field of Instrumentation and Control Systems engineering.

On-going tasks are covering several work packages and plant systems with significant safety requirements: Remote Handling, Buildings, Magnets (e.g. PFC), Cryogenic Plant, Tritium Plant, Test Blankets, Diagnostics, PCS, Heating Systems (i.e. NB Test Facility, ECH, ICH).

CIEMAT Exp. 241.286: Manufacturing and supply of the RF Subsystem for IFMIF-EVEDA LIPAc Accelerator:

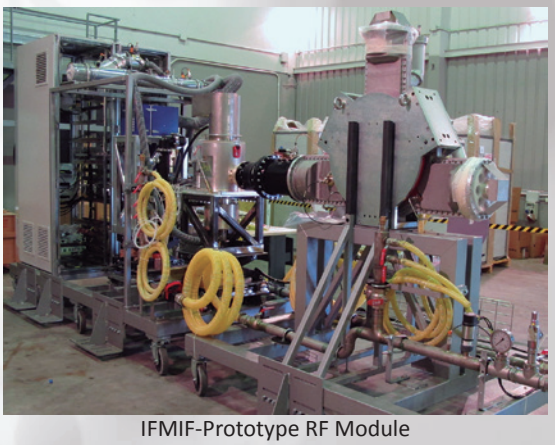
Includes Supply, Installation, and Support of 16 RF Power Chains (i.e. 8 x 105kW & 8 x 200kW) at 175Mhz, including RF Coaxial Lines and Low Voltage Distribution and Control, integration and commissioning laboratory for the RF Amplifiers and Conditioning of the RF Couplers and a RF System EPICS based Local Control and Cooling Control Systems.

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy/ Oil&gas / Public Administration / Bank

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001; PECAL 2110: NATO requirements for ensuring Quality in design, development and production; PECAL 2210: NATO requirements for ensuring Quality of software, supplemental to PECAL 2110; PECAL 2310: NATO requirements for quality management systems of suppliers for aviation, space and defense industries; UNE-EN 9100 aerospace series: Quality management systems. Represent the common framework for quality management of aerospace activities; UNE-EN 9110: Aerospace. Quality management systems. Requirements for aerospace industry maintenance organizations; CMMi (Capability Maturity Model Integration): Model for improving and assessing the development and maintenance processes of systems and software products; TMMi (Test Maturity Model Integrated): Model for improving test processes, supplemental to the CMMi DEV model; UNE-ISO/IEC 27001: Information security in IT; UNE-ISO/IEC 20000-1: Excellence of IT services management; EMAS: According to Regulation ( EC) Nº1221 / 2009 of the European Parliament and of the Council of November 25th 2009; UNE EN ISO 50001: System Energy Management



IFMIF-Prototype RF Module

INGECIBER, S.A.

| | |
|---|---|
| **COMPANY NAME** | **INGECIBER** |
| **ADDRESS** | **Avda. Monforte de Lemos, 189. 28035 Madrid. Spain** |
| **WEB** | **www.ingeciber.com** |
| **TURNOVER** | **480,000 € in year 2015** |
| **EMPLOYEES** | **22 in year 2015** |
| **CONTACT PERSON** | **Miguel Ángel Moreno** |
| | **POSITION CEO** |
| | **PHONE +34 913 862 222** |
| | **EMAIL ma.moreno@ingeciber.com** |
| | **SME Yes** |

### Company activities and skills:

Ingeciber is an Engineering company founded in 1986 specialized in the Finite Element Method (FEM) and CAE Simulation tools. We develop Engineering Consultancy Services, training services, CAE Software Distribution and Technical Support in the Civil and Mechanical engineering industries.

Ingeciber has a Software Development and Consultancy Engineering Departments with over 30 years experience in the CAE applied to Mechanical, Civil and CFD engineering including the FUSION and FISION Nuclear Power Sector. Additionally we have the hardware and software required to perform any structural and CFD simulation analysis using our own CAE software as CivilFEM for ANSYS and CivilFEM powered by Marc, and other CAE tools such as ANSYS, Marc, CFD++, XFLOW and other applications.

Since Ingeciber was founded we have always been present in the most innovative engineering sectors. Our activities have been also to provide ITER/F4E and some NPP projects with the analysis, design and checking of structures, devices and equipments using CAE consulting with FEM and CFD software.

### Large scientific facilities and national research facilities contracts:

1. F4E main contract awarded: F4E-OMF-356 Framework service Contract for the “Provision of Engineering Support in the field of Mechanical analysis for the Vacuum Vessel”. Awarded (IO Portal) October 2012.
2. “Modeling and design features for the seismic analysis of the IRIS vessel, core barrel and internals”. ENSA, 2010. The main result of the non-linear dynamic analysis was the evaluation of the effects of including the isolator device on the seismic response of the reactor in addition to its compliance to applicable standards.
3. “Design and checking of structural elements of buildings of the Nuclear Plant type AP 1000”. Westinghouse, 2011. Ingeciber did the structural analysis, checking & validation with ACI 349 and AISC NF 690 with ANSYS and CivilFEM Nuclear Power Plant module.

### R&D projets:

AZIMUT (2010-2013): The aim of this R&D project was to generate the needed know-how and technology to develop an off-shore wind turbine of 15 MW in 2020. This project was coordinated by GAMESA and 11 companies and 22 Research Centers participated.

Ingeciber performed different activities: First Ingeciber was in charge of the analysis of the numeric analysis technologies existents for the off-shore structure analyses. Second Ingeciber

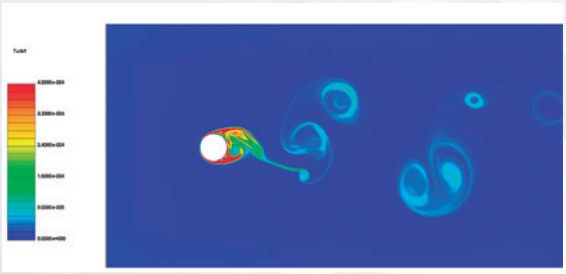
studied different configurations of welded joins using numerical analysis technics. Third Ingeciber performed CFD Von Karman vortex Shedding analyses of a cylinder for high Reynolds number.

**Markets:**

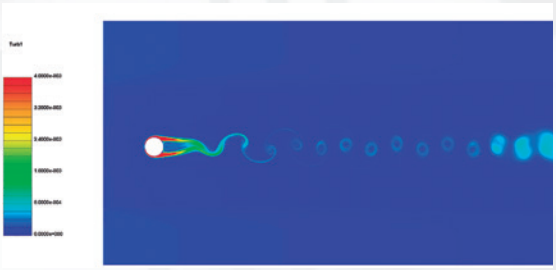
Nuclear / Automotive / Naval / Energy / Oil&gas / Construction

**Quality certifications, nuclear qualifications:**

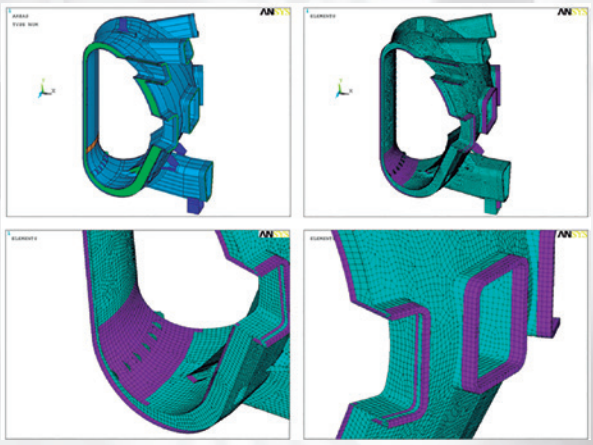
ASME, ISO 9001, NRC USA



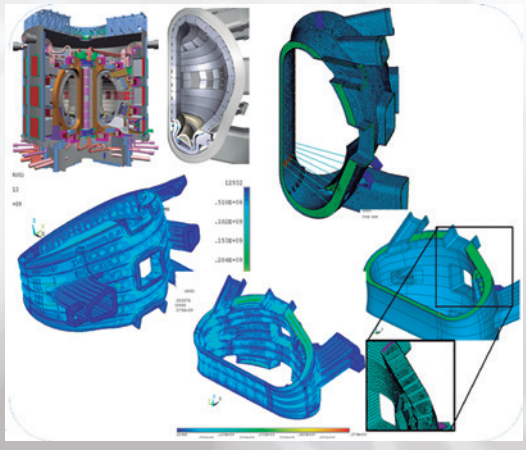
Computer Fluid Dynamic analysis. Von Karman vortex shedding for high velocities



Computer Fluid Dynamic analysis. Von Karman vortex shedding for low velocities



FEM Structural analysis of the Iter Tokamak. Geometry and mesh



FEM Structural analysis of the Iter Tokamak. Mesh and results

INGEMETAL

| | |
|---|---|
| **COMPANY NAME** | **INGEMETAL, S.A.** |
| **ADDRESS** | **Paseo Rosales 26, 50008, Zaragoza** |
| **WEB** | **www.ingemetal.es** |
| **TURNOVER** | **27 M€ in year 2016** |
| **EMPLOYEES** | **150 in year 2016** |
| **CONTACT PERSON** | **Javier Collado** |
| | **POSITION Technical Director** |
| | **PHONE +34 976 591 030** |
| | **EMAIL jcollado@ingemetal.es** |
| | **SME Yes** |

**Company activities and skills:**

Design and manufacturing of large electro-mechanical components including large telescope domes

Design of solar collectors, cylinder parabolic 2D, including manufacturing and erection activities

Design of solar disc collectors 3D, both heliostats and Stirling collectors

Design and construction of dynamic metallic structures

General metallic structures, including large infraestructures as fooball stadiums, bridges or airports

**Large scientific facilities and national research facilities contracts:**

Contracts in Astronomy:

[CEFCA, OAJ] Design and construction of mail dome for the javalambre survey telescope T2580, 2013-2014

Other contracts in Science & Space:

[INTERNAL FUNDING] Conceptual design of the Javalambre survey telescope T250 dome, 2013

[CNES, ESA] Payload cargo container for the space project Ariane, 2000

[F4E, ITER] Manufacture, supply and assembly of metal structures, facades and metal decks in TB06, 2016

**R&D projets:**

[INTERNAL FUNDING] Design of mail dome for Javalambre survey telescope T250, 2013

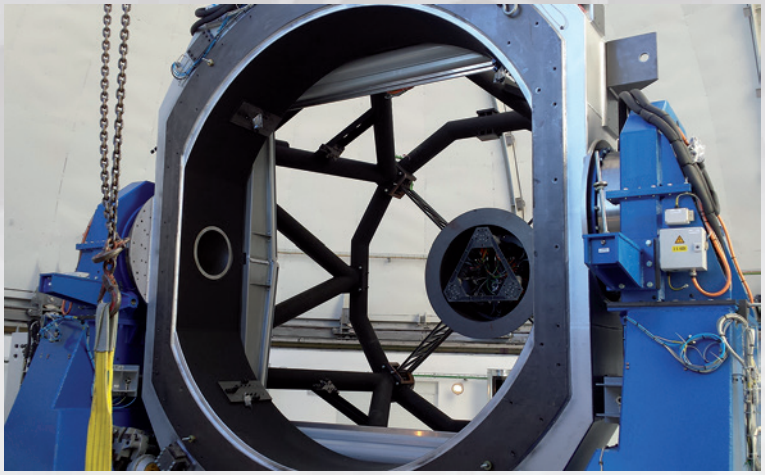
[ITA-INNOVA] CFD wind loads analysis on structures, 2014

**Markets:**

Nuclear / Aeronautics / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, WELDING EUROPEAN ENGINEER



Design & Construction of the Javalambre survey telescopeT250 main Dome, 2014


ESA Payload cargo cotainer project Ariane 2000

Design & Construction of the Javalambre survey telescopeT250 main Dome, 2014


ESA Payload cargo cotainer project Ariane 2000

**COMPANY NAME** INSYTE, S.A.
**ADDRESS** C/ Calidad, 6 P I Los Olivos, 28906 Getafe, Madrid
**WEB** www.insyte.es
**TURNOVER** 6.1M€ in year 2015
**EMPLOYEES** 80 in year 2015
**CONTACT PERSON** Raquel Rodríguez Quintero
**POSITION** General Manager
**PHONE** +34 916 010 991
**EMAIL** rrodriguez@insyte.es
**SME** Yes

### Company activities and skills:

Design and Assembly of electronic products, design & assembly of electronic boards and assembly of harnesses to work in harsh environments. Test of electronic boards, and complete products: electrical, fucntional, boundary- scan, JTAG, environmental. Capacity to apply varnish and automatic cleaning. For quality control we count with SPIs, AIO and X-ray machine among main ones. For cables also capability to test: frequency, continuity, high voltage, interferometry, attenuation, insertion- loss, etc.

### Large scientific facilities and national research facilities contracts:

We have worked in the past for CERN and ESRF. Currenly we work with ILL but with purchase order not with contract. Same for CERN and ESRF in the past.

Another company in the nuclear sector Tecnatom, seme, we work under purchase order not contract and with Siemens Energy same thing

### R&D projets:

- Medical automatic dispenser for poly-medicated people
- Wireless public light controllers
- Corporal multi-sensors systems
- Intelligent houses for independent people with needs
- Sensor network for aids in preventing accident in industrial and construction environments.
- RPAS for avoiding aerial accidents due to birds
- Robot to analyze the surfaces (recent one to start this year)

### Markets:

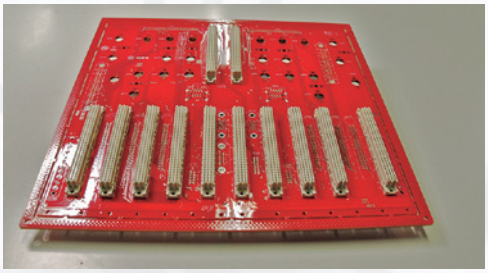
Nuclear / Defense / Naval / Aeronautics

### Quality certifications, nuclear qualifications:

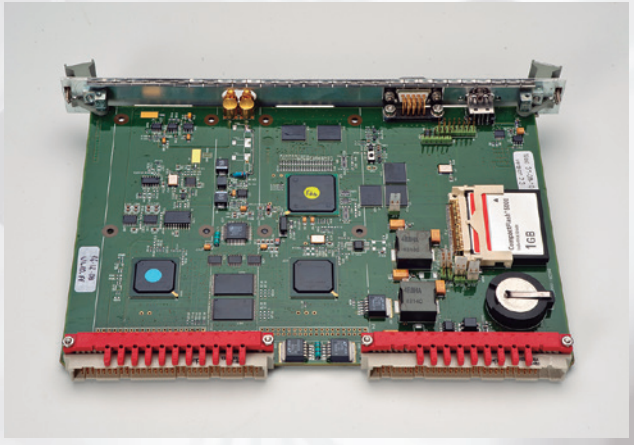
ISO 9001, ISO 14001, ISO9100, IPC-610, IPC-620

Automatic varnish machine

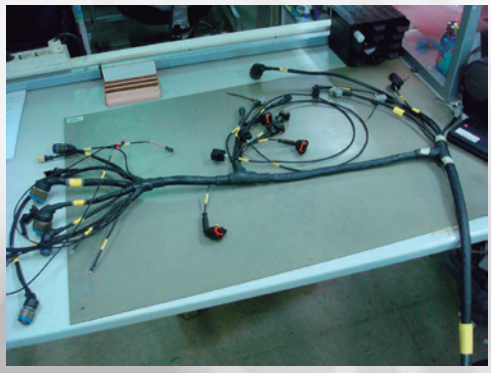
Internal cabling for racks and boxes



Press-fit technology



Complex assembly of boards



Complex and long cables for communications, fiber optics and power

| | |
|---|---|
| **COMPANY NAME** | **INDUSTRIAS DE TECNOLOGÍAS APLICADAS EN REFRIGERACIÓN Y CONSERVACIÓN, S.L.** |
| **ADDRESS** | **P.I. Los Santos, Pa 10. P.Box 410; 14900 Lucena (Córdoba), Spain** |
| **WEB** | **www.intarcon.com** |
| **TURNOVER** | **9.9 M€ in year 2016** |
| **EMPLOYEES** | **97 in year 2016** |
| **CONTACT PERSON** | **José María Raya Portero** |
| | **POSITION General Manager** |
| | **PHONE +34 957 509 293** |
| | **EMAIL info@intarcon.com** |
| | **SME Yes** |

**Company activities and skills:**

INTARCON is a Spain-based company dedicated to designing, manufacturing, marketing and servicing a full range of refrigeration equipment for commercial and industrial sectors.

The mission at INTARCON is to develop and offer the markets a wide range of innovative solutions for the most reliable, efficient and sustainable operation of refrigeration facilities.

The human team of INTARCON has valuable experience of over 30 years in the fields of refrigeration, air conditioning and related thermal appliances, focusing the effort on the conception and development of a wide range of innovative refrigeration solutions.

Presently, INTARCON has supplied more than 30 000 units and systems to more than 40 countries all over the world by mean of a sales and service network in more than 30 countries.

INTARCON is highly concerned about the environment and carries out many R&D projects conducted to develop environmentally friendly solutions based in energy saving and efficiency.

**Large scientific facilities and national research facilities contracts:**

- European Southem Observatory (ESO): Design, manufacturing and testing of custom-made -25ºC glycol chillers for ESO Paranal site, in Atacama desert in Chile, placed at 3000 meters above sea level under incredible low ambient humedity, to maintain accurate conditions for the electronic and optical equipment of VLTi auxiliary telescopes.
- CERN, European Organization for Nuclear Research: precision chiller

**R&D projets:**

[CDTI] Efficity – Development of efficient refrigeration cycles for ultra light electrical urban transport and domestic applications with high performance ari cooling and predictive maintenance solutions (2016) Exp. ITC 20161113

[CDTI] DESEHVAC – Design and development of air conditioning processing of air cooling with control of temperature and humidity by means of nanometric spray of desiccant liquids (2015) Exp. ITC 20151330

[CDTI] ECOMARKET – New refrigeration system with natural refrigerant for supermarket (2015) Exp. ITC 20151100

HUMIDEX project – Coworkers as suppliers with committee company (2014)

[IDEA] Effimarket – Expansion of production capacity in manufacturing plant for industrial

refrigeration equipment (2013)

[CDTI] AIRE –Variable capacity efficient air conditioning systems for electric buses (2013) Exp. ITC 20131012

[CDTI] Development of prototypes and series of a new generation (2008) Exp. IDI 20080962

**Markets:**

Defense / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

ISO 9001, RoHS, CE, F-Gas


Chiller installed at ESO premises, Atacama desert, Chile

INTEGRASYS

| | |
|---|---|
| **COMPANY NAME** | **INTEGRASYS S.A** |
| **ADDRESS** | **Calle Esquilo 1, Las Rozas. 28232 Madrid. Spain** |
| **WEB** | **www.integrasys-sa.com** |
| **TURNOVER** | **1M€ in year 2016** |
| **EMPLOYEES** | **16 in year 2016** |
| **CONTACT PERSON** | **Juan Carlos Sánchez** |
| | **POSITION Director** |
| | **PHONE +34 916 316 846** |
| | **EMAIL juan.sanchez@integrasys-sa.com** |
| | **SME Yes** |

### Company activities and skills:

Integrasys, established in 1990, is an SME software development and engineering company specialized in the design, development and integration of both Real-Time and Non Real-Time software for automated systems in the telecommunication and aeronautical fields. The company also develops software for systems such as multimedia terminals, man machine interface GUIs, services access software for broadband interfaces and tailored turn-key measurement systems under computer control in the areas of quality assurance, conformance testing, satellite signal monitoring and surveillance and type approval test certification of telecommunications equipment.

### Large scientific facilities and national research facilities contracts:

Integrasys main capacities for ITER activities are to provide R&D and consultancy services in software based monitoring and control systems. Our main skills in this regard are in signal monitoring, network manager and managed applications over SNMP, middleware, RF & microwave automated test and measurement systems, development of software and technology based on open standards and for embedded systems, etc. Therefore our main interest in ITER is in CODAC related activities.

### R&D projets:

R&D project for CERN to support the White Rabbit Remote Management functionality (2010-2012). The activities in this project included: design, development, implementation and testing of Std. IEEE 802.1Q functionalities and management capabilities in the White Rabbit Ethernet Switch being developed by CERN. The White Rabbit Switch is the key component of the White Rabbit System that provides precision timing and high accuracy synchronization (sub-nanosecond accuracy and picoseconds precision) in an Ethernet-based network.

R&D KA-METROKAL project for ESA to design, manufacture and test a high precision (+/- 0.5 dB uncertainty) metrology and calibration system breadboard and application software able to perform fast, accurate and inexpensive calibrations of wideband RF-receive paths of ground stations operating in Ka-band. The calibration system accurately characterizes the gain-noise-temperature performance of RF frontend chains and is applicable to communications, radio- and radar-astronomy ground stations.

System components required nowadays for RF calibration at high frequencies, such as power standards, measurement instrumentation and microwave elements are relatively scarce, expensive and require a very careful assembly and integration. KA-METROCAL will enable the following specific improvements: i) Accuracy improvement with minimum hardware size,

assembly and costs; ii) HW and SW integration to eliminate costly instrumentation; and iii) Minimum service interruption during calibration. Maximum in the order of 1-5 seconds.

**Markets:**

Defense / Aeronautics / Space / Oil&gas

**Quality certifications, nuclear qualifications:**

CMM-2 (Software Development)

Monitoring and Control Systems

**COMPANY NAME** INGENIERÍA DE SISTEMAS PARA LA DEFENSA DE ESPAÑA S.A.,S.M.E.,M.P.
**ADDRESS** C/ Beatriz de Bobadilla 3, 28040 Madrid. Spain
**WEB** www.isdefe.es
**TURNOVER** 143.19 M€ in year 2015
**EMPLOYEES** 1.548 in year 2015
**CONTACT PERSON** Manresa, A.
**POSITION** Development Manager
**PHONE** +34 914 115 011
**EMAIL** amanresa@isdefe.es
**SME** Yes

**Company activities and skills:**

Consultancy

Technical Assistance

Engineering and Operations Services

Turn-Key Projects

**Large scientific facilities and national research facilities contracts:**

[GTC ] Participation in the OSIRIS instrument design and development, 2005-2014.

[ESA] ESAC Scientific Astronomy Operatión and Development Support, several contracts fron 2005 to date, 40 Engineers and Scientists.

[ESA] Test Bed Telescopes, Desing, Development and installation of 2 Robots Telescopes, 2012 to date.

[NASA] Support to Radio-astronomy Activities in Madrid Deep Space Communications Centre, MDSCC, 2000 to date.

**R&D projets:**

[CDTI] Cherenkov Telescope Array Feasibility Study for CTA, 2010

[IAC] Collaboration Agreetment, 2011.

[INTERNAL FUNDING] Cooperation in Education for Science and Astronomy Research CESAR, 2010 – to date.

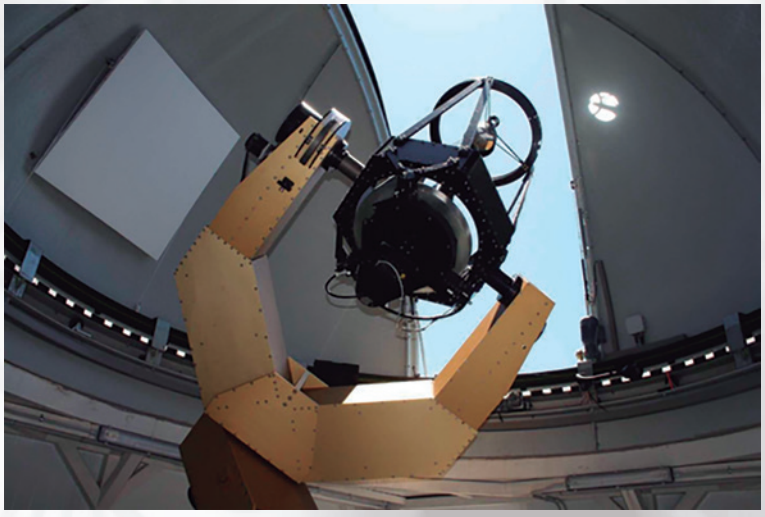
**Markets:**

Defense / Aeronautics / Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO14001, PECAL/AQAP 2110

TBT Telescope in the Satellite Tracking Station at Cebreros



CESAR Project Telescope, ESA-Cebreros

| | |
|---|---|
| **COMPANY NAME** | **ITMA MATERIALS TECHNOLOGY** |
| **ADDRESS** | **Parque Tecnologico de Asturias, 33428 Llanera, Asturias** |
| **WEB** | **www.itma.es** |
| **TURNOVER** | **5M€ in year 2016** |
| **EMPLOYEES** | **112 in year 2016** |
| **CONTACT PERSON** | **M. Armindo Guerrero / Ricardo Lezcano** |
| | **POSITION Head of Engineering Area / Head of Steel and Metallurgy Area** |
| | **PHONE +34 985 129 120** |
| | **EMAIL armindo@itma.es / r.lezcano@itma.es** |
| | **SME No** |

**Company activities and skills:**

ITMA is a Spanish private and non-profit technological organization, which aims at promoting industrial innovation through applied research and technological development in the field of materials science. The activities developed by ITMA include the performance of R&D projects, technical assistances and technological services, collaborating with industries on the development of either added value or cost-reduction solutions. ITMA manages two centres with nearly 7.000m$^2$, 4.600m$^2$ of which are dedicated to laboratories. Research performed in ITMA is multidisciplinary and targets Metallic Materials, Refractories, Active Materials, Plastics and Composites. In addition, there are 3 cross-sectorial areas, namely Technological Services, Surfaces and Engineering.

The areas of specialization of interest for Large Scientific Infrastructures include Welding, Structural Mechanics or the development of new metallic materials, all of them included in the Steel & Metallurgy area, where the whole cycle of such metallic materials and alloys is included, i.e. from development, fabrication routes and characterization to application. The activities performed deal with extending service life, optimising in-use behaviour, improving mechanical, wear or corrosion resistance, increasing their formability and weldability and studying new materials selection and application.

The engineering area makes available to the industry the most technologically advanced and innovative tools for the design and analysis by means of the Finite Element Method (FEM), providing a complete service in product and process optimitization, validation and cost reduction. The area counts on extensive experience in process simulation, including manufacturing processes such as welding, rolling.

**Large scientific facilities and national research facilities contracts:**

[ITER] IO16CFE13464JTR. Thermal-hydraulic FE model of the integrated equatorial port plugs (2017).

[ASTURFEITO] S.A.U. EUREKA-ALMA. Development of Steel structures for radiotelescope antennas and development of its manufacturing procedure. (2008)

**R&D projets:**

CIBER-POS: Virtual Design of Cyber-Physical Production Optimization Systems for Long Production Factories – RFCS-2015-RPJ-709669

RED WELDS: Rapid Evaluation of Distortions in Welded Structures. ManuNet Program. Ref:

IDE/2013/000229

MODELCOR: Modular Simulation Tool for In-Service Behaviour Prediction of the Cooling Water Systems of the Steelmaking Industry. RFCS-CT-2013-00033.

SAFETOWER: Develop tailored manufacturing safe methods for wind towers erected in remote areas based on an integrated tower concept and optimal use of high strength steels. RFCS-CT-2010-00028

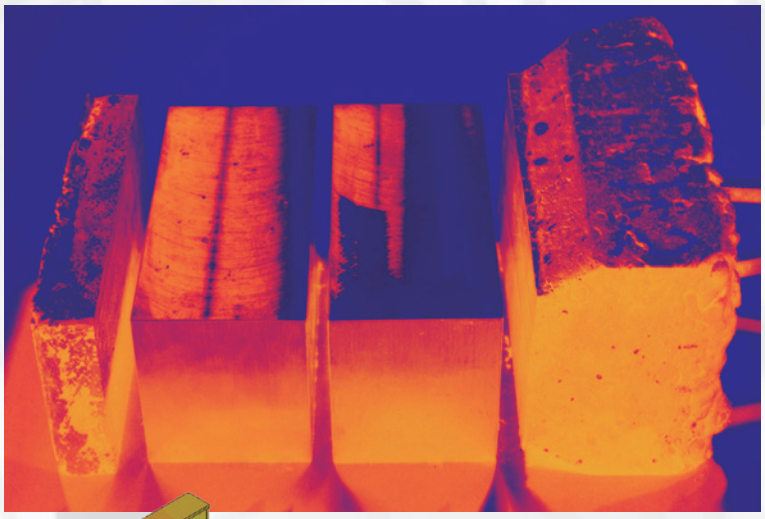
TECNOFUS: Programa de Tecnología de Fusión. Consolider Ingenio 2010. CSD-2008-00079

**Markets:**

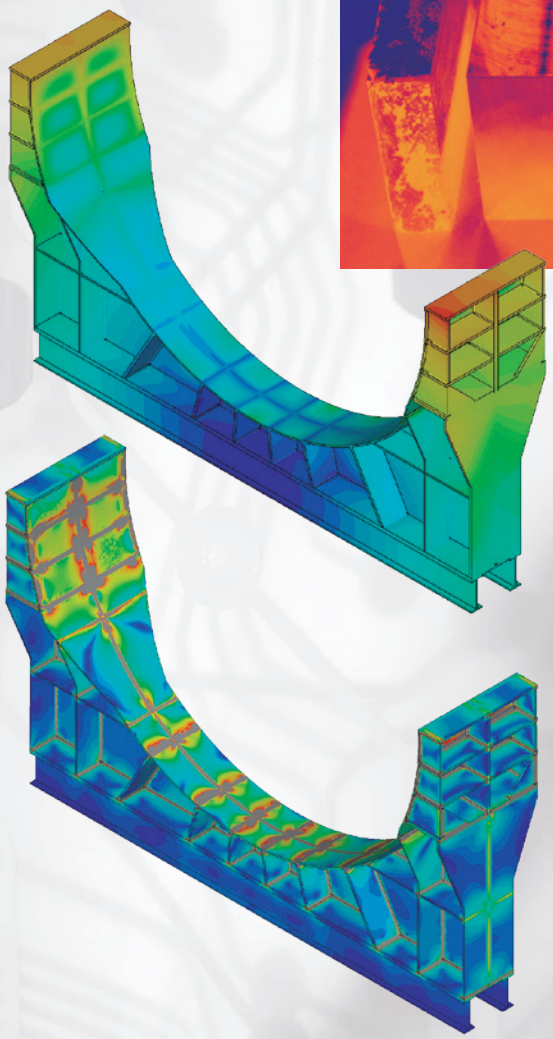
Nuclear / Defense / Automotive / Naval / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

ASME, ISO 9001, ISO 17025, ISO 17020



Reduced Activation Ferritic Martensitic Steel - Experimental heats developed at ITMA



Tool to predict welding distortion in large welded assemblies

**COMPANY NAME** JEMA ENERGY S.A.
**ADDRESS** Paseo del Circuito 10, 20160 Lasarte-Oria, Gipuzkoa, Spain
**WEB** www.jemaenergy.com
**TURNOVER** 27,345,643 € in year 2015
**EMPLOYEES** 123 in year 2015
**CONTACT PERSON** Ibon Cerro
**POSITION** Technical Area Manager
**PHONE** +34 943 376 400
**EMAIL** i.cerro@jemaenergy.com
**SME** No

## Company activities and skills:

Since 60 years, Jema designs and manufactures Static Power Converters for different sectors, such as Power Plants, Oil & Gas, Plasma Physics, Particle Accelerators, Magnetic Resonance Imaginary (MRI), Railways, Smart, Grid, Renewable Energy and Electromobility. We are customer orientated, developing bespoke systems and solutions which meet specific requirements of each project. These are innovative solutions with high technological content. The company is part of Irizar Group (2600 employees and yearly turnover over 500 M€).

Jema can supply a range of Power Supplies for the different magnet coils and heating systems used in a nuclear fusion installation. Over 20 years, Jema has developed several custom power supplies for most of the Experimental Fusion Reactors in Europe (MAST, JET, W7X, TJ-II, TCV, etc). Jema is interested in continuing its commitment with the Fusion Community, especially in Power Supplies for the different magnet coils and heating systems used in a nuclear fusion installation.

## Large scientific facilities and national research facilities contracts:

Science – Particle Accelerators

[RAL- ISIS] 4 x HVPS Tetrode 20kV/20A (400kW) (2016)

[IFIC- IFIMED] 2 x HVPPS Klystron 150kV/110A, 16,5MW peak, 5us pulse, 400Hz rep rate (2016)

[RAL – ISIS] 1 x HVPS Tetrode 20kV/20A 400kW (2015)

[CIEMAT- IFMIF] 7 x HVPS Tetrode 11kV/34A (375kW); 4 x HVPS Tetrode 8kV/45A (360kW) (2015)

[ESS Bilbao] 2 x HVPPS Klystron 120kVdc/60A, 7.2MW peak, 9% duty cycle (2015)

[ESS Bilbao - SNS Oak Ridge] 1 x HVPPS Klystron 85kVdc/160A, 14MW peak, 9% duty cycle (2013)

[ESS Bilbao- ITUR] Power supplies for ion source; 110kVdc/120mA, 25kVdc/2A, 80Vdc/100A, 800Vdc/2A (2010)

[RAL - FETS – ISIS] 3 x HPPS 25Vdc/300A, <10ppm (2009)

[GSI - DESY-II] 1 x AC Dipole 1330V/1004A; 1 x DC Dipole 1560V/520A; 2 x Quadrupole 210V/650A; 3 x Sextupole 85V/200A, <10ppm (2009)

Science – Fusion Energy

[Tokamak Energy- ST40] 1 x BvU PS 12kA ±500V, 1 x Central Solenoid PS +17.1kA -14.5kA 1Kv, 1 x Toroidal Field PS 100kA/100V 0,6s pulse (2017)

[TAE- C2W] 2 x Electrode PSU 5kV/300A 50ms pulse (2017)

[F4E- JT60SA] 1 x MHVPS 60kV/2x55A pulsed 100s, 2 x BPS 35kV, 100mA and 2 x APS 50kV/100mA (2018)

[TAE- C2W] Pulsed magnet PS; 1100V/3600A cells can be combined up to 4 in series and parallel (max 63MW) 2016)

[CCFE- MAST upgrade] Multi-megawatt IGBT brake chopper and a high-current crowbar(2015)

[CEA Cadarache- JT60SA] 1 x Toroidal Field PS 1kVdc/±20kA, 20MW continuous; 4 x Equilibrium Field PS ±1 kVdc/±20 kA and ±1 kVdc/+10 kA,-20 kA, 12% duty cycle (2016)

[IPR- SST-1] 1 x Solid State HV Crowbar -70kV (2013)

[ENEA- JT60SA] 4 x Central Solenoid + 2 x Equilibrium Field PS 1kV/±2*10kA, 12% duty cycle; 2 x Fast Plasma Positioning PS 2kV/±5kA, 7% duty cycle (2017)

[CCFE- MAST upgrade] Low Voltage PS 92kA at 262Vdc 24MW (2015)

[CCFE- MAST upgrade] Divertor Field Power Converter 700Vdc/4-10kA, 7MW, 0,4% duty cycle (2015)

[CCFE- MAST upgrade] Toroidal Field Power Supply 340Vdc/133kA, 45MW, 0,3% duty cycle (2015)

[IPR- ITER gyrotron test] 1 x Solid State HV Crowbar -70kV (2011)

[CCFE- MAST upgrade] 1 x HVPPS for Positive Ion Neutral Injector (PINI) 80kVdc/70A, 5,6MW, 2% duty cycle (2010)

[EFDA- JET]4 x Seriable Power Supplies ±12kVdc/±5kA, 60MVA, 10% duty cycle for Enhanced Radial Field Amplifier (ERFA)] (2009)

[CIEMAT – TJII] 1 x HVPPS for Electron-Cyclotron Resonant Heating (ECRH) gyrotron 80kVdc/50A, 0,1% duty cycle (2007)

[CRPP- ITER gyrotron test] 1 x Solid State HV Crowbar -85Kv (2005)

[EFDA- JET] 4 x HVPPS for Neutral Beam Enhancement (NBE) 130kVdc/130A, 16,9MW, 3% duty cycle and crowbars (2009)

[EFDA- JET] 8 x LTT crowbars 130kV(2009)

[IPP- Wendelstein 7-X] 10 x Control Coils Power Supplies ±30Vdc/±3Ka (2002)

[EFDA- JET] 2 x HVPPS for Neutral Beam Enhancement (NBE) 130kVdc/130A, 16,9MW, 3% duty cycle and crowbars (2003)

[EFDA- JET] 4 x LTT crowbars 130kV (2003)

**Markets:**

Nuclear / Defense / Space / Energy / Oil&gas / Renewable Energy / Smart Grid and Electromobility

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

JEMA facilities ESS-Bilbao Project

**COMPANY NAME** LEADING METAL MECHANIC SOLUTIONS, S.L.
**ADDRESS** Barrio La Agüera, s/n - 39409 - San Felices de Buelna (Cantabria) Spain
**WEB** www.leading.es
**TURNOVER** 19M € (2016)
**EMPLOYEES** 120
**CONTACT PERSON** Marcos Pérez
**POSITION** Business Development Director
**PHONE** +34 610 261 493
**EMAIL** mperez@leading.es
**SME** Yes

## Company activities and skills:

OVERVIEW:

LEADING is focused on complex mechatronic and mechanical solutions with high levels of innovation by integrating different capabilities and workshops; engineering, machining, mechano-welding, TIG and laser welding, tooling manufacturing and supply chain management.

FUSION CAPACITIES: Mechanical design with development of 3D models and 2D drawings, engineering simulation studies, machining simulation, welding simulation…

Components manufacturing: machining of complex components, complex joining technologies, beryllium management & manufacturing, coatings, thermal treatments, mechatronics, NDT and DT examination among other services.

INTERESTS IN FUSION PROGRAM: Complex mechatronic and mechanical solutions with high levels of innovation for small and medium size components.

## Large scientific facilities and national research facilities contracts:

F4E – Splice Plate Custom Machining for JT-60SA TF-Magnet – Ref. F4E-OPE-0805 (2016)

ESS – Fabrication of ESS Targets Cassetes – Ref. 162/16 [2016]

F4E – Supply of Full-Scale Prototypes of the ITER Normal Heat Flux (NHF) First Wall (FW) Panels – Ref. F4E-OPE-443 (IV-PT) [2014]

F4E – Fabrication of a Standard Semi-Prototype of the ITER Normal Heat Flux (NHF) First Wall (FW) Panels – Ref. F4E-OPE-394 (IV-PT) [2012]

F4E – Engineeering Support in the Area of Plant Systems – Ref. F4E-2008-OPE-017 (ES-AC) [2009]

ESO – ALMA Foundation Alignment Tool [2009]

## R&D projets:

ITER BLANKET (IDC-20101156): IdC CDTI.

Applied Research Focused on Experimental Development of “First Wall Wall” for ITER Experimental Fusion Reactor: definition of FWP optimum manufacturing sequence, study of technologies related to joining and coating technologies

COMP_ITER (2013/INN/054): Línea INNOVA 2013. Gobierno de Cantabria.

Industrial Research focused on the manufacture of components for ITER Experimental Fusion Reactor: study and application on a prototype of orbital welding technologies, canning, assembly, material characterization.

ITERCAST (2014/INN/038): Línea INNOVA 2014. Gobierno de Cantabria.

Industrial Research focused on plasma facing components process manufacturing for ITER Experimental Fusion Reactor: development of an alternative manufacturing route by casting of the Central Beam Support (CBS), geometrically the most complex component of FWP.

ITERCUT (2014/INN/034): Línea INNOVA 2014. Gobierno de Cantabria. On-going.

Industrial Research on the FWP cutting process for the ITER Fusion Experimental Reactor: wire electrical discharge machining process (simulation model, cutting monitorization, comparative between simulation and real results).

FUSION TECHNOLOGIES (IDI-20151082): PID Colaboración CDTI. On-going

Advanced manufacturing technologies in Science Industry. Application for Fusion Sector: study on joining and machining of complex and dissimilar materials (beryllium, tungsten, ceramics); development of near net shape (NNS) processes; development of NDE procedures for serial manufactured components.

ESS TARGET CDTI (IDI-20160181): PID Individual CDTI. On-going

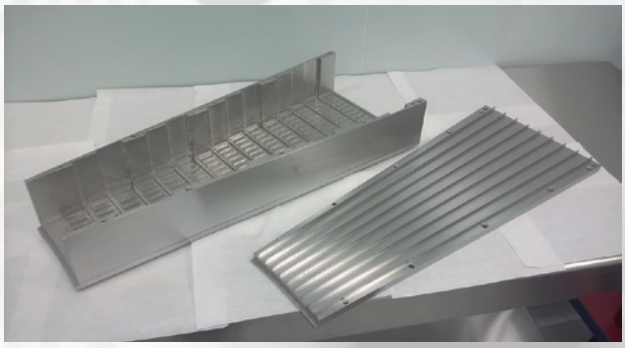
Industrial research focused on the development of metallic components for European Spallation Source Target (ESS): Development of prototypes of the following metal-mechanical components: Proton beam window, Reflector, Shaft and adjustment with the wheel, Beryllium as structural material.

**Markets:**

Nuclear / Defense / Aeronautics / Space / Oil&gas

**Quality certifications, nuclear qualifications:**

ASME, RCC-MR, ISO 9001, ISO 14001



[ESS] Casette First Prototype - 2015


[F4E] Semi-Prototype (SP) of First Wall Panel (FWP)

| | |
|---|---|
| **COMPANY NAME** | **LIDAX** |
| **ADDRESS** | **C/ Antonio Alonso Martín, 1. 28860 Paracuellos de Jarama, Madrid** |
| **WEB** | **www.lidax.com** |
| **TURNOVER** | **2.3 M€ in year 2015** |
| **EMPLOYEES** | **35 in year 2015** |
| **CONTACT PERSON** | **Jesús Aivar Mateo** |
| | **POSITION Business Development Manager** |
| | **PHONE +34 916 780 805** |
| | **EMAIL comercial@lidax.com** |
| | **SME Yes** |

### Company activities and skills:

LIDAX is a Technological SME founded in 2000, certified by UNE-EN-09100. Our Engineers develops high advanced opto-mechanical subsystems used as part of on-ground (Astronomy, Space, Fusion) or space based instrumentation, from design through to the delivery of integrated and tested equipment, under control from the Project Management Office and Product Assurance Managers. LIDAX specializes in advanced opto-mechanical systems and high accuracy cryogenic/hot mechanisms that operates under extreme conditions. In a fully integrated centre of 1800 $m^2$, LIDAX concentrates the development office for design and engineering activities, the assembly, Integration/ Clean Room areas (ISO 5 & ISO 7), the thermal testing laboratory & optical metrological equipment (e.g. CMM in Clean Room Area). The company product line specialization are: Focal Plane Assemblies, Spectrometers, Telescope Optics Mounts, Equipped Mirrors, High Accuracy Cryogenic/Hot Mechanism, Cryogenic Linear Actuators & Dry Lubricated Gearboxes, Cryogenic Heat Switches, among other advanced technologies.

### Large scientific facilities and national research facilities contracts:

[INTA] ITER Thermal Characterization Campaign for Optical Samples for ITER Diagnostic Systems in a Custom Thermal Vacuum Chamber (+250ºC), developed by LIDAX, 2016

[ESA/INTA] Development of EXOMARS RAMAN Instrument: iOptical Head Thermo-Mechanics & Autofocus Mechanism, 2014

[ESA/THALES] Development of FCI&IRS Telescope Optics for MTG Satellite Series: Optical Mounts and Environmental Test Campaign. Thermo-Mechanics, 2013

[ESA/AIRBUS] Development of Co-alignment Sensor-ATLID Earthcare Satellite: Thermo-Mechanics, 2012

[ESA] Cryogenic Testing Campaign of EchO Fine Steering Tip/Tilt Mechanism, 2011

[ESA/THALES] Development of a Coarse Lateral Sensor PROBA 3. Thermo-Mechanics, 2009

[IAC] Atmosphere and Telescope Simulator for New Adaptative Optics, 2009

[ESA/INTA] Development of a Focal Plane Assembly for BEPICOLOMBO Satellite MIXS-T & MIX-C. Thermo-Mechanics, 2007

[ESA/INTA] Development of a Focal Plane Assembly for PLATO Satellite. Thermo-Mechanics, 2009-2016

[ESA/INTA] Development of JWST Mid IR Instrument Simulator 4 Cryogenic Folding Mirror, 2008

[IAC] Elmer Folding Mirrors for the Gran Telescopio Canarias. 2005

[IAC] Primary mirror M1 lateral supports for the Gran Telescopio Canarias (GRANTECAN) Thermo-Mechanics 2001

**R&D projets:**

[ESA] Qualification of different Bonding Processes using different materials combination (VDA Kapton, Heaters, MLIs)

[ESA] Development of Cryogenic Heat Switches 30-80K for Focal Plane Assemblies & Cryocoolers in EO/Scientific Intruments, 2015

[UE] Development of a Deployer Mechanism & Carrousel for an Ultrasonic Planetary Core Drill for Space Robotic Exploration 2014

[ESA] Development of a Family of Space Planetary Gearboxes (Dry Lubricated), 2012

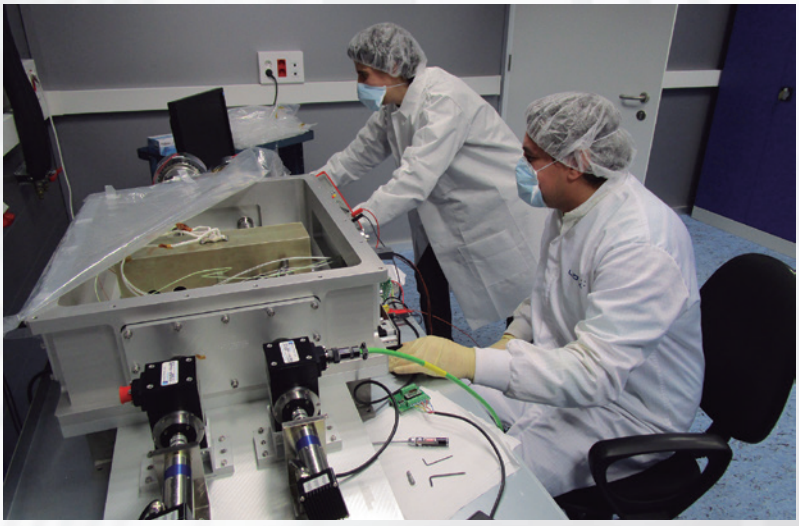
[UE] Integrated Laser Tool for different applications (welding, power transmission, metrology,…)

**Markets:**

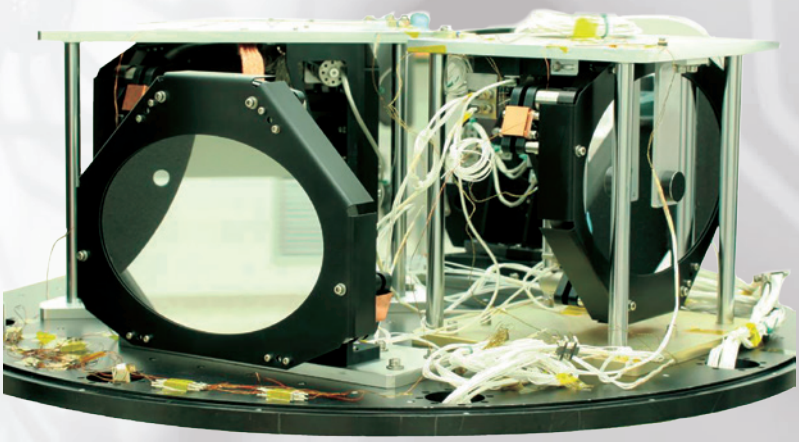
Aeronautics / Space / ITER / Astronomy On Ground

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 9100



Hot Temperature & Vacuum Chamber used for ITER Optical Samples thermal characterization (250ºC)



Cryogenic Folding Mirrors MIRI Telecope Simulator James Webb

| | |
|---|---|
| **COMPANY NAME** | **METROMECÁNICA SL** |
| **ADDRESS** | **Malpica Calle E nº 32-39 Nave 43, 50016 Zaragoza, Spain** |
| **WEB** | **www.metromecanica.com** |
| **TURNOVER** | **3,700,000 in year 2016** |
| **EMPLOYEES** | **40 in year 2016** |
| **CONTACT PERSON** | **Fernando Comín** |
| | **POSITION CEO** |
| | **PHONE +34 639 201 666** |
| | **EMAIL fcomin@metromecanica.com** |
| | **SME Yes** |

## Company activities and skills:

**Company:**

Metromecánica offers solutions in the metrology field, from the dimensional control of one part, to the adjustment of geometry and automation of the more complex installation.

We have an experience of more than 15 years at industrial solutions, with direct presence national and international.

Metromecánica is a company with high qualified staff, our instruments and software are last generation.

Optimization, efficiency, flexibility, study of processes, technology and quality. Those words are in our philosophy, quality is our main objective, also being a global partner with high capacity to act everywhere in the world.

**Quality:**

We at Metromecanica make a daily effort to reach our objectives, a task that carries certification to ISO 9001, ISO 14001 and EN9100 standards, a process-management system that comply with all our clients' needs and expectations.

The Quality and Environmental model that we have adopted leads us to constant on-going improvement, in which client focus and client focus and on-going training team, besides their compromise with the Environmental are the two main strands in process of improvement, thus achieving an increase in the effectiveness and efficiency of our services.

"Planning, Communication, Responsibility, Ability and Compromise with the Environmental are the four pillars that under pin our company policy, and that consolidated the Quality and Environmental Management System that has been adopted."

**Services summary:**

- Geometry adjustment: Production tooling and its maintenance
- Dimensional verification of production parts.
- Parts and tooling scanning. Reverse engineering process
- Geometry in machine tools.
- Metrology personnel.
- Portable measuring equipment renting.

- Development of automated measurement applications
- Documentation development
- Training

**Large scientific facilities and national research facilities contracts:**

ITER-"Alignment & Metrology" (2016-2017)

ITER-"Alignment & Metrology" (2015)

**R&D projets:**

ITER-"Alignment & Metrology" (AÑOS 2016-2017)

ITER-"Alignment & Metrology" (AÑO 2015)

DICON-Desarrollo de nuevos sistemas avanzados de control dimensional en procesos de fabricación de sectores de alto impacto. (IPT-2011-1191-020000) (AÑOS: 2011-2012-2013-2014)

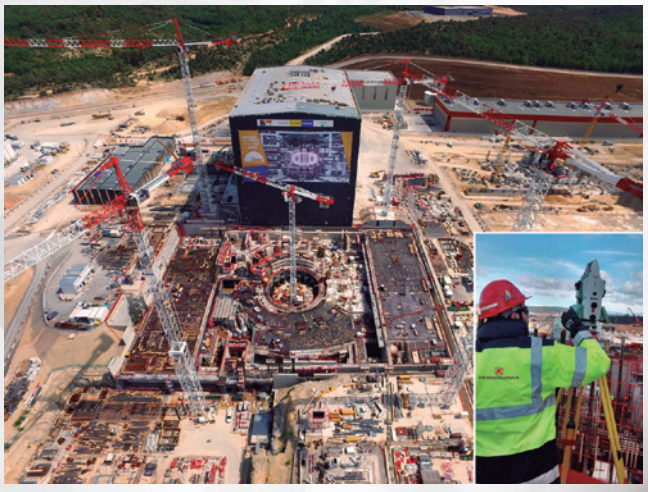
SINIDE-Sistema inteligente de acabado de piezas y utillajes mediante sistema de pulido y desbarbado IPT-020000-2010-034 (AÑOS: 2010-2011-2012-2013)

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy

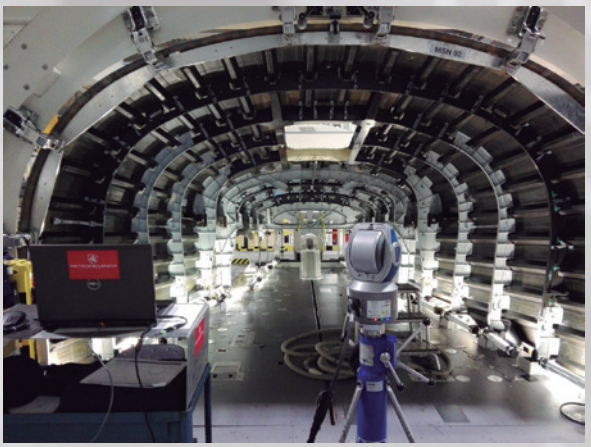
**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001



Aerial view of the central building (Tokamak Building) and the annex building (Assembly Hall) where the components of Tokamak are pre-assembled. (November 2016)

Metrology laboratory with CMM machines



3D Dimensional Control-Laser tracker

| | |
|---|---|
| **COMPANY NAME** | **NATEC (NUMERICAL ANALYSIS TECHNOLOGIES, S.L.)** |
| **ADDRESS** | **C/ Marqués de San Esteban, 52, Entresuelo D, 33206, Gijón, Spain** |
| **WEB** | **www.natec-ingenieros.com** |
| **TURNOVER** | **626 K€ in year 2015** |
| **EMPLOYEES** | **10 in year 2016** |
| **CONTACT PERSON** | **Javier Ordieres Tuero** |
| | **POSITION General Manager** |
| | **PHONE +34 984 199 692** |
| | **EMAIL javier.ordieres@natec-ingenieros.com** |
| | **SME Yes** |

**Company activities and skills:**

NATEC is an engineering company specialized in advanced analysis: nonlinear and coupled analysis in the mechanical, thermal and electromagnetic fields. Main capabilities demonstrated in projects carried out in the framework of ITER are:

Structural integrity assessment according to nuclear codes (RCC-MR, ASME and SDC-IC) of VV components, Port Plugs and In-Vessel components.

Welding process simulation to predict distortions during the manufacturing of the ITER components:, Diagnostic Port Plugs, Toroidal Field Coil Cases and Vacuum Vessel.

Mechanical design, engineering and manufacturing analysis of ITER Equatorial and Upper Prot Plugs.

**Large scientific facilities and national research facilities contracts:**

ITER/CT/4300001412. Engineering structural integrity justification for diagnostic attachments to the ITER VV and FE Analysis for the PPD Division. Thermal-structural analyses, fatigue assessments following EN 13445 (2016)

ITER/CT/4300001396. Engineering support for the ITER Diagnostic Team. Thermo-mechanical, structural and seismic analysis of diagnostic components. FE models, load characterization, development of routines to update the models and insert detailed components.Creation of SLS for diagnostic system. (2016)

F4E-OMF-0508-01/TO1.Electromagnetic Analyses of the European TBM Sets: VDE UP exp16ms cat III/ VDE DOWN exp16ms cat III/ VDE linear 36 mscat III/ MD cat II/ MD Cat I/ MD cat IV. (2014)

ITER/CT/4300001412. Engineering support for the IC&LH Section. Contribution to the design assessment. (2014)

ITER/4300000850: Diagnostic Engineering Support with emphasis on bolometer and visible infra-red. (2013)

ITER/CT/43000000866. Engineering support for the ITER diagnostic design, with particular emphasis in the areas of mechanical, TH and EM analysis. Checking of appropriate codes and standards against diagnostic designs: RCC-MR,ASME,SDC-IC. (2013)

F4E-OMF-356: Provision of Engineering support in the area of mechanical analysis for the VV (ESMAVV). Vacuum Vessel Analysis: Structural, Thermomechanical, Coupled analysis. Structural integrity assessment following RCC-MR. Advanced analysis techniques (sub-modelling, sub-

structuring, CMS…) several code assessments were performed according to RCC-MR regarding protection against P-type, S-type damage and Fatigue. (2012)

ITER/CT/12/4300000598: Engineering support for mechanical, thermos-hydraulic and electro-magnetic analysis for the ITER diagnostic components. TH, EM, Structural, Seismic and Modal, leading to a Transient Dynamic analysis under EM loads from a Plasma Disruption event, and structural integrity assessment. (2012)

F4E-2008-OPE-297 (ES-AC): Toroidal Field Coil Case Welding Simulation. Numerical simulation of the deformations/distortions induced in the TF coil structure by the closure welding procedure. (2011)

F4E-2009-OPE-033 (ES-AC): Revision of the Structural Design Criteria for In-Vessel Components (SDC-IC). The SDC-IC was reviewed in order to incorporate the modifications included in the last versions of nuclear pressure equipment codes as ASME, RCC-MX and RCC-MR.(2010)

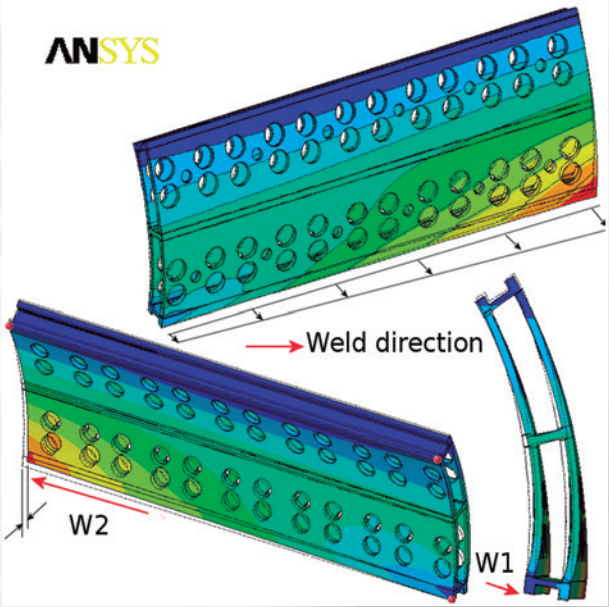
F4E-2008-GRT-024 (PMS-DG): Detailed design of a representative equatorial port plug. (2009)

**Markets:**

Nuclear

**Quality certifications, nuclear qualifications:**

ISO 9001




Welding distortion prediction for Iter components

Nortemecánica

| | |
|---|---|
| **COMPANY NAME** | **NORTEMECÁNICA, S.A.** |
| **ADDRESS** | **Area Industrial de Tabaza I, parcela E-5, E-33469 Carreño (Asturias) Spain** |
| **WEB** | **www.nortemecanica.es** |
| **TURNOVER** | **5 M€ in year 2016** |
| **EMPLOYEES** | **39 in year 2016** |
| **CONTACT PERSON** | **Susana Fernández** |
| | **POSITION Export Manager** |
| | **PHONE +34 985 579 857** |
| | **EMAIL comercial@nortemecanica.es** |
| | **SME Yes** |

**Company activities and skills:**

Nortemecánica is a reference in manufacturing, assembly and commissioning of capital goods, machinery and spare parts for the industry, with over 20 years'experience.

Nortemecánica, posted sales in excess of €5 million, more than 80% of which comes from its intensive activity with countries all around the world.

In its own facilities (7.150m$^2$), following activities are developed:

- Boiler making and welding
- Machining and adjustment
- Assembly and testing
- Quality control
- Verification

Nortemecánica currently employs 40 people and is equipped with the high technology standard. We incorporate the latest technical advances, like for example, two Laser Trackers and a heated area for verification and assembly at constant temperature that has been recently built at our premises. This area and the heated room in which the 6 meter-long-milling machine is located, allows us to achive tolerances without precedents (30 microns in 5 meters length).

**Large scientific facilities and national research facilities contracts:**

ESRF - Manufacturing and supply of 65 Girders (2016-2018) Description: Manufacturing, assembly, testing and delivery to the ESRF site of 65 girders assemblies for the ESRF Storage Ring.

SESAME - Manufacturing and supply of 16 Girders and one prototype (2014-2016) Description: Desing and Manufacturing of Girder-System of the SESAME Storage Ring.

XFEL - Manufacturing and supply of 40 Insertion Device Support Systems (2012-2014) Description: Production, assembly, testing, documentation, packing and supply of 40 undulator carriages. Motion control system, alignment and commisioning included.

CELLS - Manufacturing and supply of supply of 32 Girders and one prototype (2007-2008) Description: Manufacture and supply of 32 Support Structures for the Storage Ring of the ALBA Synchrotron and its prototype.

ESRF - Manufacturing and supply of ID Support Systems (since 1995) Description:

Manufacturing and supply of different types of Insertion Devive Support Systems (Apple II, In-vacuum ondulator mobile carriages, etc).

CERN - Manufacturing and supply of 14 Schuffling Module Vacuum Vessels (2005-2006) Description: Manufacturing and supply of 14 Schuffling Module Vacuum Vessels and 2 prototypes for the Large Hadron Collider (LHC).

**Markets:**

Nuclear / Energy / Oil¬gas

**Quality certifications, nuclear qualifications:**

ASME, ISO 9001, ISO 3834-2

Manufacture, assembly, alignement, commissioning and supply of 40 Insertion Devices Support Systems for the XFEL Project in Hamburg

Support structures for the Storage Ring of the SESAME Synchrotron in Jordan

| | |
|---|---|
| **COMPANY NAME** | **OBEKI ELECTRIC MACHINES S.L.** |
| **ADDRESS** | **C/ Baratzondo, 3 Pol. Ind. Apatta-Erreka · 20400 Ibarra · Spain** |
| **WEB** | **www.obeki.com** |
| **TURNOVER** | **7M€ in year 2015** |
| **EMPLOYEES** | **38 in year 2015** |
| **CONTACT PERSON** | **Gorka Astarbe** |
| | **POSITION Engineering and R&D manager** |
| | **PHONE +34 943 679 900** |
| | **EMAIL gorka.astarbe@obeki.com** |
| | **SME Yes** |

**Company activities and skills:**

At Obeki we calculate, design, manufacture and test low voltage electric generators and motors for applications with special requirements such as not standard speed and torque requirements, harsh ambient conditions, vibration, shock, seismic certification for nuclear power plant installations, etc.

**Large scientific facilities and national research facilities contracts:**

[ITER] F4E-OPE-285 (2016) Supply of Slewing Motor for DCHLB Tokamak/Assembly Hall Cranes

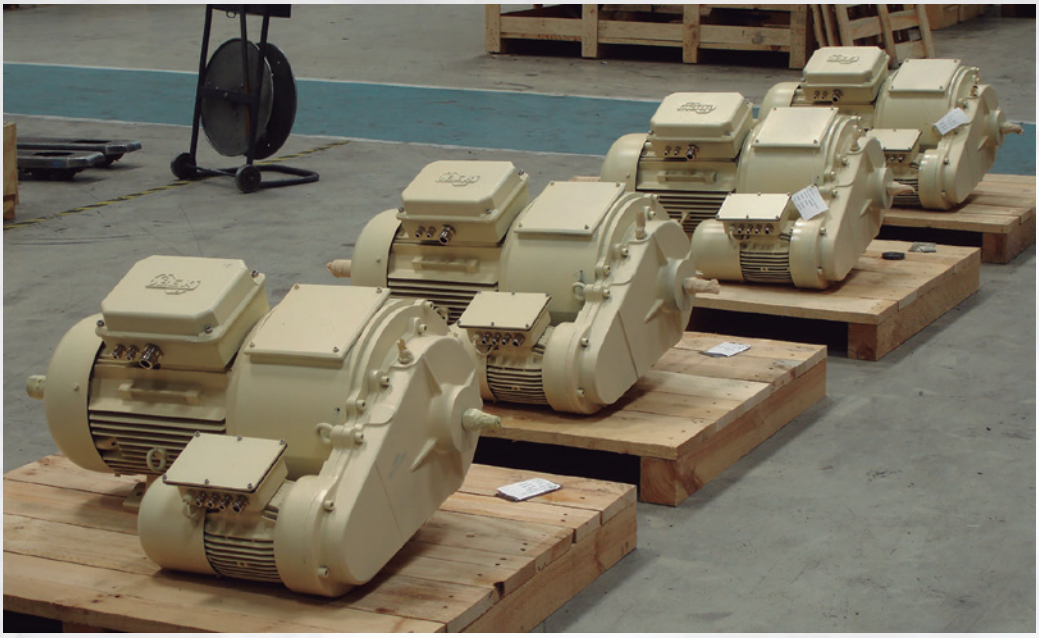
Supply of electric motor. Design, manufacturing and testing of a 2,1 kW three phase electric motor for Slewing movement for DCHLB Tokamak/Assembly Hall Cranes

**Markets:**

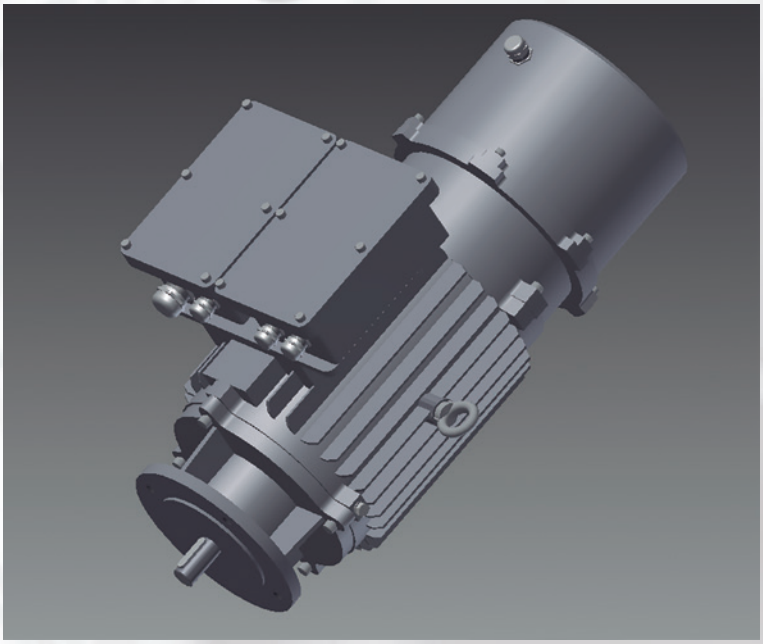
Nuclear / Naval / Energy / Oil&gas / Industrial & tower cranes / steel plants / water management

**Quality certifications, nuclear qualifications:**

ISO 9001, UNE 73401 (Quality Assurance in nuclear installations)



A set of OBEKI microspeed brake-motors manufactured for a French nuclear power plant.



Picture of the motor supplied within the contract “[ITER] F4E-OPE-285 (2016) Supply of Slewing Motor for DCHLB Tokamak/Assembly Hall Cranes”

| | |
|---|---|
| **COMPANY NAME** | **PROACTIVE R&D** |
| **ADDRESS** | **Av. Diagonal, 429, 3r, 08036 Barcelona** |
| **WEB** | **www.proactiverd.com** |
| **TURNOVER** | **125,000/83,000€ in year 2014/2015** |
| **EMPLOYEES** | **3 in year 2016** |
| **CONTACT PERSON** | **Juan Herranz** |
| | **POSITION Director** |
| | **PHONE +34 669 556 004** |
| | **EMAIL jherranz@proactiverd.com** |
| | **SME Yes** |

**Company activities and skills:**

Proactive R&D core competencies are Mechanical Design for High Technology Projects, such as High Precision Mechanics, UHV, New Materials and Large Infrastructures Integration.

We propose an extremely flexible and collaborative framework according to the customer's needs. We can provide from punctual and specific support within one single phase of the project, until full end-to-end -from concept design to final verification of the hardware- work packages.

Our expertise is founded in our professional experience in European Research Laboratories and Universities, as CERN (Switzerland), ESRF (France) and CSIC (Spain).

**Large scientific facilities and national research facilities contracts:**

[ESRF] Delivery of 1 low field dipole (2016)

[IAA] Thermal and structural analysis for the main cryostat of the instrument CARMENES (2014 - 2015)

[IAA] Thermal and structural analysis for the Colliamator of the instrument CARMENES (2015)

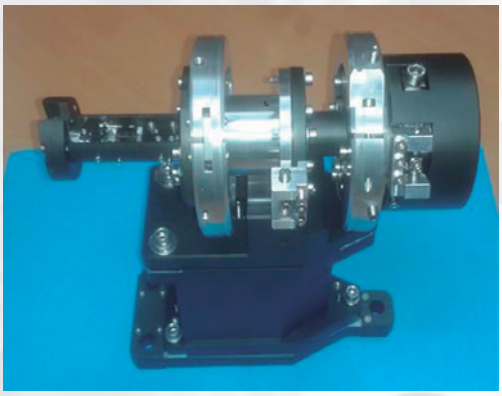
[CAHA] Optomechanical design and procurement for the optimcal mount of the Echelle for the instrument CARMENES (2015)

[IAC] Optomechanical design and procurement for the optimcal mount of the Fiber Exit Unit for the instrument CARMENES (2016)

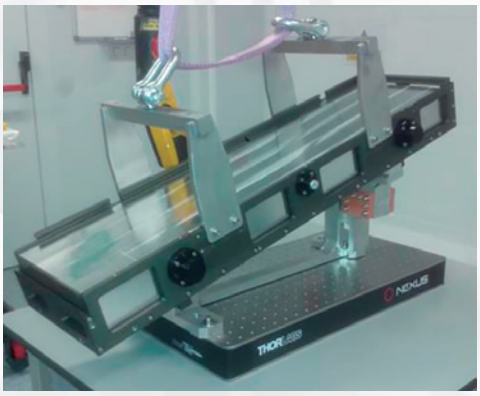
We have been in charge of the final design and the procurement of the optical mount for the FEU and we have provided technical support during the optomechanics integration and laboratory test.

**Markets:**

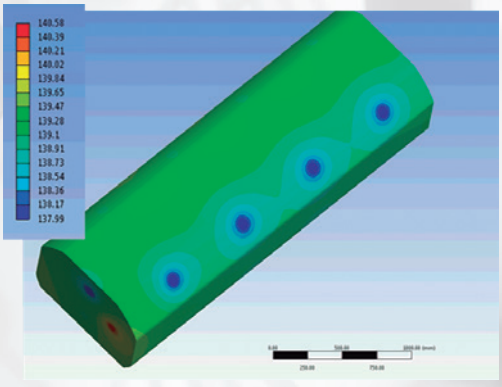
Science Industry



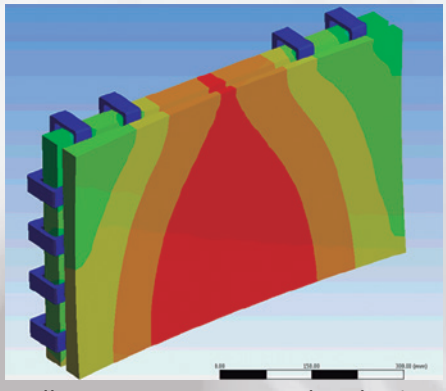
Fiber Exit Unit



Echelle



Cryostat shielding temperature distribution



Collimator temperature distribution

**COMPANY NAME** PROCON SYSTEMS
**ADDRESS** Arquímedes, 26 Badalona 08918, Spain
**WEB** www.proconsystems.net
**TURNOVER** 12,39 k€ in year 2016
**EMPLOYEES** 49 in year 2016
**CONTACT PERSON** Daniel Marchante
**POSITION** Sales Manager
**PHONE** +34 934 609 940
**EMAIL** marchante@proconsystems.net
**SME** Yes

## Company activities and skills:

Procon Systems is an industrial engineering company specialised in process automation, instrumentation and control. We are in the market since 1995 and our headquarters are located in Badalona (Spain).

The team of Procon Systems is formed by a group of young engineers and technicians with a wide expertise and experience. The staff of about 50 employees is composed by an 80% of engineers and technicians. Procon Systems has adapted its organisation to the growth achieved due to the continuous confidence of our customers during the last years.

Our project teams are based on qualified professionals with expertise in various technologies and are responsible for the total integration of the project.

Thanks to the confidence of our customers, PROCON SYSTEMS has consolidated as one of the leading companies in the market, developing its activities both in the domestic and international market. (80% export sales).

PROCON SYSTEMS is a very dynamic company, oriented to the quick utilisation of the last available technologies in the market. The projects developed by the company include a wide range of services for the industry.

The main business areas are the automotive and the big scientific facilities, including the most significant European scientific installations such as CERN and ITER.

Procon Systems is certified in accordance with DIN EN ISO 9001:2015 for Design, Fabrication, Installation and Commissioning of industrial automation projects and ISO/IEC 15504 Capability Level Software Life Cycle Processes.

## Large scientific facilities and national research facilities contracts:

CERN Personnel Protection System (PPS) for Super Proton Synchrotron (SPS) 2017

CERN Ventilation Control Systems TDC2 TCC2 2016

CERN HVAC Control System Building 107 2016

CERN HVAC Control System BAF3 2015

CERN HVAC Control System Proton Synchrotron (PS) 2012

ITER Internal Configuration Guidelines of I&C cubicles 2010

ITER Prototyping Interlock Control System (ICS) 2010

ALBA-CELLS Personnel Safety System (PSS) 2007

EFDA Control Systems for DTP2 Remote Handling System 2006

**R&D projets:**

PROTOCODAC Technological Demonstration at Prototyping Level of Experimental instruments in Conventional Control Systems for Advanced Nuclear Facilities. 2015

**Markets:**

Big Physics

**Quality certifications, nuclear qualifications:**

ISO 9001

Procon I&C Cabinets Procon Systems For Iter

RAMEM
Your Engineering and Manufacturing Partner


**COMPANY NAME** RAMEM S.A.
**ADDRESS** Verano, 9, 28850 Torrejón de Ardoz, Madrid, Spain
**WEB** www.ramem.com
**TURNOVER** 3 M€ in year 2015
**EMPLOYEES** 40 in year 2016
**CONTACT PERSON** Emilio Ramiro Arcas
**POSITION** CEO
**PHONE** +34 914 044 574
**EMAIL** e.ramiro@ramem.com
**SME** Yes


## Company activities and skills:

RAMEM provides solutions in the design, manufacture and certification of equipment and components for research centers (astronomy and particle physic) and also for Aerospace industries.

RAMEM is backed by the expereince and technology acquired since 1958, with the manuctared of more than 20,000 different equipment or components. As a result, we participate in programs such as the: ESRF, RAL, ALBA, CMAM, GRANTECAN, E-ELT, INTERNATIONAL SPACE STATION or MARS SCIENCE LABORATORY.

RAMEM is specialized in engineering and manufacturing of short series of parts and prototypes with high precision requirements and complex geometries (mechanized and mechano-welding)

Human Resources: engineers, doctors, and technicians make up a multidisciplinary work force of 40 people.

Software & Hardware Resources: Design and mechanical analysis, Documentation, Machining (CNC and EDM), Welding (TIG, MIG-MAG and laser), Assembly, Dimensional control, Inspection, Proofs and testing.

Quality Assurance: UNE-EN 9100 & UNE-EN ISO 9001

## Large scientific facilities and national research facilities contracts:

- Mechanical manufacturing and assembly of Subassemblies of the first prototypes of the Supports for the Primary-Mirror Segments of the E-ELT (ESO -in consortium with CESA)
- Mechanical manufacturing and assembly of Subassemblies of the Supports for the Primary-Mirror Segments of the GRANTECAN (IAC -in consortium with CESA)
- Mechanical components of the Rover Environmental Monitoring Station REMS, part of the MARS SCIENCE LABORATORY NASA (Centro de Astrobiología)
- Mechanical components for TRIBOLAB, equipment design for carry out micro-gravitation tribology experiments on INTERNATIONAL SPACE STATION (INTA)
- Manufacturing and assembly of X-Z tables of submicrometric precision for the positioning of quadrupoles, XFEL accelerator (CIEMAT)
- Design, Manufacturing and Assembly of the Primary Slits for Linear Accelerator of CMAM facility (PCM)
- Design, Manufacturing and Assembly of Test Bench for Magnetic Calibrations for the ALBA Synchrotron (CELLS - IFAE)

- Redesign, Manufacturing and Assembly of Polarizer Interchanger for RAL (UK) neutron accelerator (CSIC)
- Miscellaneous equipment for the Spanish beam lines of ESRF (CSIC)
- Design, Manufacturing and Assembly of Robot for Remote Detection of Gamma Radiation for (CIEMAT)

**R&D projets:**

RAMEN has research lines in innovative manufacturing such as:

- Laser Welding
- Additive Manufacturing
- Shaping of complex geometry sheet metal parts

RAMEM participates in R & D projects such as:

- EMA4FLIGHT: Development of Electromechanical Actuators and Electronic Control Units for Flight Control Systems. H2020 Clean Sky 2 project under reference 738042.
- VALEMA: VALidation tests of ElectroMechanical Actuators and its dedicated control units at TRL 6 level. H2020 Clean Sky 2 project under reference 755615.
- HyproCell Development and validation of integrated multiprocess HYbrid PROduction CELLs for rapid individualized laser-based production H2020 project with reference number 723538 has been funded under the FoF call and is coordinated by Lortek
- SELENA CDTI (Technological and Industrial Development Centre) under the contract EXP 00080416 / IDI-20150633 to collaborate in the manufacturing of AM parts
- ICARO project: National funded project coordinated by RAMEM for the replacement of TIG welding by laser welding in complex aircraft parts
- PROSAVE (Advanced Systems for an Airplane More Eco-efficient) research project was a National funded project coordinated by CESA in the development of systems for more ecologic aircrafts.
- GANS (Gas Aerosol Nucleation Spectrometer) project funded by Eurostars (2012-2014). RAMEM has manufactured highly complex parts, some of them with AM.
- BUONAPART-E (Better Up-scaling and Optimization of Nanoparticle and Nanostructure Production by Means of Electrical Discharges) project FP7. RAMEM has been in charge of the design and manufacture of a prototype with demanding precision features

**Markets:**

Defense / Aeronautics / Space / Energy / Research Centers

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, OASIS International Aerospace Quality Group

Support for Primary Mirror of GRANTECAN

X-Z table of submicrometric precision for the positioning of cuadrupoles XFEL accelerator


**COMPANY NAME** SCIENTIFICA INTERNATIONAL, S.L.
**ADDRESS** Xixilion 2 bajo, Pabellon 10 20870 Elgoibar, Spain
**WEB** www.scientifica.es
**TURNOVER** 500K€ in year 2016
**EMPLOYEES** 8 in year 2016
**CONTACT PERSON** Lander Gonzalez Larrea
**POSITION** Business Development Manager
**PHONE** +34 943 127 285
**EMAIL** lglarrea@scientifica.es
**SME** Yes

## Company activities and skills:

SCIENTIFICA INTERNATIONAL, S.L.U. is a company devoted to the development and manufacturing of instrumentation equipment for the science market.

With experience and technical skills in 3 main core technologies, such as, precision mechanics, electronics & signal processing, and composite materials, SCIENTIFICA has collaborated with several European scientific facilities and institutions, like, ISIS, CIEMAT, ESS-Bilbao, ILL, HZB, JET and CERN.

It has an important activity in the development of radiation detectors in various fields, such as: position sensitive neutron detectors for neutron scattering applications, ionization chambers for fusion diagnostics applications,

It is also important its activity in the design and development of electronic systems, analog and digital, for different applications like diagnostics (fusion and particle physics), motion control and detectors.

Finally, expertise in composite materials leads to a remarkable activity in radiation hard materials and other new materials and parts developed and manufactured for structural and functional purposes in a wide range of applications.

## Large scientific facilities and national research facilities contracts:

[GTC] Design and supply of control system of the MOS of MEGARA instrument (2017). Supply contract. As part of bigger contract of AVS, the control system of the MultiObject Spectograph of the MEGARA instrument at Gran Telescopio de Canarias, has been designed and supplied. This includes custom electronic boards with drivers and control electronics, crates, cabling, comunication, firmware and low level control software.

[JET] Design and supply of 16 channel Low Noise Transimpedance Amplifier (2016). Supply contract: Design, supply and testing of a low noise transimpedance amplifier for fusion diagnostic system at JET.

[ESS Bilbao] Design and supply of versatile neutron detector platform (2016). Design and supply of a position sensitive scintillator neutron detector platform for experimental development. Supply contract.

[CIEMAT] Supply of 3 ionization chambers. Supply contract. Design and manufacturing of 3 ionization chambers for fusion diagnostic system (2013).

[ILL] Manufacturing of 6 CF analyzer's structures (2012). Manufacturing of a CF structure for

neutron backscattering analyzer. First prototype and other 5 units. Supply contract.

[ISIS] Supply of position sensitive neutron detector for PEARL Instrument (2010-2012). Supply of detector banks, electronic channel and crates of the upgraded detector of PEARL instrument in TS1 at ISIS., radio shielding parts for neutron detectors and other mechanical parts. Set of supply contracts.

[ISIS] Supply of radioshielding parts (2011). Supply contract: Supply of radio shielding parts for neutron detectors and other mechanical parts. Supply Contract.

**R&D projets:**

[CIEMAT] Design of radioconductivity diagnostic system (2014). R&D Contract.

[University of Santiago de Compostela] Development and manufacturing of a semi-automated test bench for scintillator crystals (2013). Semi-automated test bench for scintillator crystals' quality control to be used in the manufacturing of CALIFA calorimeter, an instrument in FAIR facility, in collaboration with University of Santiago de Compostela. R&D Contract.

[CIEMAT] Supply of 3 ionization chambers. Supply contract. Design and manufacturing of 3 ionization chambers for fusion diagnostic system (2013). R&D Contract.

[ILL] Design and feasibility study of carbon fiber analyzer's structures (2011). R&D contract.

[CERN] Design and simulation of a Faraday cup for a beam diagnostic system for HIE ISOLDE (2011). R&D contract.

[ILL] Design of doped composite parts for vacuum carters (2010): Design of boron carbide doped carbon fiber laminates to use in vacuum carters for neutron guides. R&D contract.

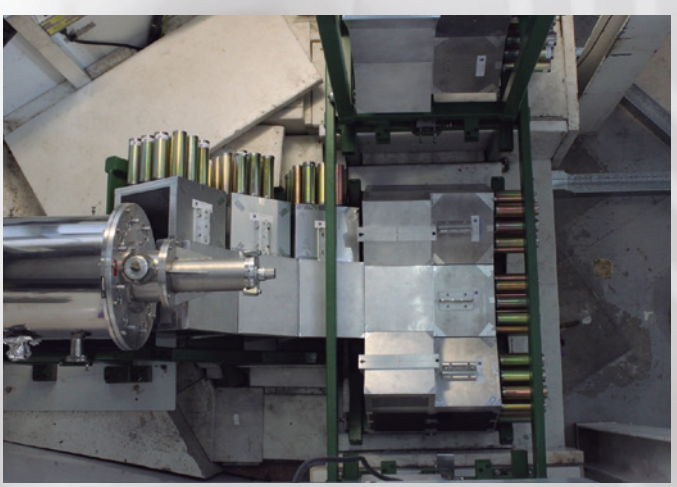
**Markets:**

Science Industry

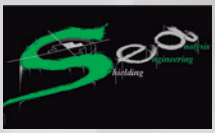
**Quality certifications, nuclear qualifications:**

Low Noise Transimpedance Amplifier for fusion diagnostics at JET. 4 channel card in a up to 16 channel crate

5 units of CF neutron backscattering analyzer



PEARL High Pressure Powder Diffractometer Intrument's neutron detector banks. While commisioning



| | |
|---|---|
| **COMPANY NAME** | **SEA INGENIERIA Y ANALISIS DE BLINDAJES S.L.** |
| **ADDRESS** | **Av. Atenas 75, Las Rozas 28232 Madrid, Spain** |
| **WEB** | **www.seaingenieria.es** |
| **TURNOVER** | **100,000 in year 2016** |
| **EMPLOYEES** | **3 in year 2016** |
| **CONTACT PERSON** | **Pedro Ortego** |
| | **POSITION Technical Director** |
| | **PHONE +34 695 183 077 +34 608 717 167** |
| | **EMAIL p.ortego@seaingenieria.es** |
| | **SME Yes** |

**Company activities and skills:**

Highly specialized in the analysis of radiation transport problem by the use of three-dimensional Monte Carlo tools, mainly MCNP familiy of codes.

Main capabilities in the area of fusion include:

- Design of shielding elements, design of buildings layout for the installation of radiation sources, design of shielding materials for fusion spectrum neutrons

- Analysis of neutron damage, neutron activation, neutron heating and gas production

- Analysis of residual dose at shutdown due to the neutron activation of the shielding materials and of the components near the neutron source

- Determination of residual dose maps

**Large scientific facilities and national research facilities contracts:**

[Fusion for Energy ] Shielding design and residual dose analysis for European TBM (2013)

Design of the shield layout for the European Tritium Breeding Modules intended for installation in Equatorial Port Plug #16 of ITER. Includes the study of the different shielding material options, different layouts for the coolant pipes through the shielding, the calculation of the activation of the shielding itself and of the surrounding structural elements and of the equipment located nearby and the final calculation of the residual dose after shutdown.

[CIEMAT ] Preliminary design of IFMIF beam dump (2016)

Conceptual design of the IFMIF facility defining the thickness of the building walls around and the ceiling over accelerator beam dump. Calculation of dose at operation and after shutdown. Definition of a shielding device to reduce the activation in front of the beam dump opening.

[CIEMAT ] Design of local shielding of IFMIF-EVEDA beam dump (2010)

Analysis of the limiting dose points in the existing facility building (Rokkasho) in order to optimize the shielding elements. Design of a new local shielding using a combination of heavy and light materials. Definition of a especial room in front of the beam dump entrance to redfuce the activation of the equipment present in the accelerator vault. Calculation of activation and dose maps around the beam dump.

**R&D projects:**

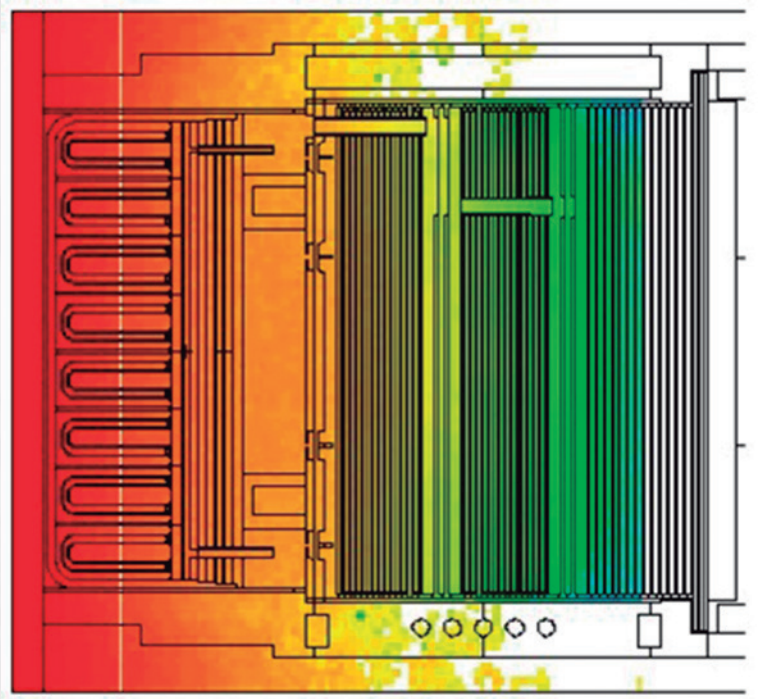
[ITER Organisation ] Vitrified B4C (2016)

Development of a shielding material based on boron carbide with the use of a binding made of boron silicate.

**Markets:**

Nuclear

**Quality certifications, nuclear qualifications:**



Neutron flux gradient through the TBM shielding

**COMPANY NAME** SENER INGENIERÍA Y SISTEMAS S.A.
**ADDRESS** C/ Creu Casas i Sicart, 86-88. Parc de l'Alba.
08290 Cerdanyola del Vallès (Barcelona), Spain
**WEB** www.aerospace.sener
**TURNOVER** 650 M€ in year 2015
**EMPLOYEES** 2,410 in year 2015
**CONTACT PERSON** Joan-Manel Casalta
**POSITION** Business Development Manager Science & Astronomy
**PHONE** +34 932 276 563
**EMAIL** joanmanel.casalta@sener.es
**SME** No

## Company activities and skills:

SENER Ingenieria y Sistemas, S.A. is an Engineering and Construction company backed by more than 60 years experience (50 years in Space). Innovation, commitment to quality and independence are our corporate values. International leader in Aerospace Engineering, Aeronautics and Vehicles, Actuator and Control Systems, Civil Engineering and Architecture, Power and Processes and Marine Engineering.

In the field of Large Scientific facilities, SENER is recognized for its capability to perform multi-disciplinar projects in opto-mechanics, instrumentation including optics, mechanics, electronics and SW and large mobile structures, actuators and control infrastructures.

## Large scientific facilities and national research facilities contracts:

Astronomy: Mechatronics, optomechanics and structures for Ground and Space telescopes

[ESO] E-ELT M2 and M3 Cells. Mechanisms for 4 m and 3.5 tons mirrors (2017- )

[IAC/ING] WEAVE instrument Focus Translation System (2015-2016)

[ESO] ALMA radiotelescopes, Amplitude Calibration Robotic Arms: 70 units (2008-2012)

[ESO] E-ELT M5 Field Stabilisation Unit Conceptual design and Demonstrator (2007-2010)

[ESO] VLT GRAAL Main Assembly. Rotator with Adaptative Optics (2007-2010)

[CEFCA/Univ Sao Paolo] JPCam Actuator System. High Precision Hexapod (2012-2015)

[GTC] EMIR instrument DTU & CSU Electronics and Control in cryogenics (2005-2015)

[UK ATC/ESO] VISTA Telescope M2 Unit (2002-2006)

[GTC] M2 Drive System. Hexapod and Tip-tilt mechanism (2000-2005)

[ESA] JUICE: Medium Gain Antenna, Magnetometer Boom and JANUS/GALA Instruments Electronics (2016 - )

[ESA] SOLAR ORBITER: Antennas & Instruments Subsystems, Booms, EPD/SO-PHI (2010 - )

[ESA] ROSETTA: Deployable booms, louvres, filter wheel (1997-2004)

Particle Physics:

[ALBA] X-Ray Mirror Bender with nanometre correction (2014 - )

[CIEMAT] Participation in the design and supply of the L3 experiment for LEP (CERN)

[ESS Bilbao] Studies for ESS preparatory phase and auxiliary equipment (2006-12)

Fusion

[F4E] Micromechanical analysis for the Pre-compresion Rings (2012 - 2013)

[F4E] Engineering works of the TB08. ITER Site Infrastructure works.

[EFDA/ITER] Remote Handling design studies: Cassette Toroidal Mover (2000-2005)

**R&D projects:**

[INTERNAL FUNDING] X-Ray mirror Bender detailed design and prototype (2015-2016)

[CDTi/INTERNAL FUNDING] FUSKITE: Tritium recovery experiment Testing (2011-2015)

[FP7] European Solar Telescope M2 Drive System (2007-2010)

[INTERNAL FUNDING] High Precision off-the-shelf Hexapod (2010)

**Markets:**

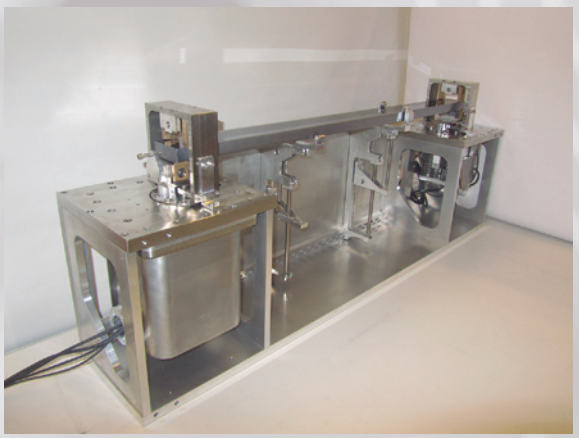
Nuclear / Defense / Naval / Aeronautics / Space / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

E-ELT M5FU Conceptual Design and Demonstrator
(Credits ESO)

WEAVE Focus Translation System



X-Ray Mirror Nanobender

| | |
|---|---|
| **COMPANY NAME** | **SERTEC SL** |
| **ADDRESS** | **Av. Rita Levi Montalcini 14, Parque tecnológico Tecnogetafe 28906, Getafe, Madrid, Spain** |
| **WEB** | **www.sertec.net** |
| **TURNOVER** | **4.8 M€ in year 2015** |
| **EMPLOYEES** | **50 in year 2016** |
| **CONTACT PERSON** | **Eduardo Cano Corral** |
| | **POSITION Business Manager** |
| | **PHONE +34 917 241 775** |
| | **EMAIL Eduardo.cano@sertec.net** |
| | **SME Yes** |

## Company activities and skills:

SERTEC is a Spanish company with 20 years of experience. Its main activities are focused in engineering, test and instrumentation of structures, composite materials, tooling and control systems, as well as automation and systems (UAVs, antennas).

Activity is focused in turnkey projects including engineering services as analysis, design, development, management and manufacturing of systems, equipment, tooling and non-conventional structures in the following areas: aeronautics, space, defence, simulation, railways, marine, automotive and nuclear.

SERTEC has developed and integrated designs and systems, for companies such as AIRBUS, BOEING, IAI, INDRA, NAVANTIA, TALGO, CAF, CERN and ESA.

Competences have been carried out in product design as well in tooling design. CATIA V5 Experience in PDM and PLM software. (Sprint, Optegra, Primes, Smart team). Mechanical design supported by stress analysis department with NASTRAN, PATRAN, FEMAP, ABAQUS, ANSYS FLUENT, ESA CRACK, ADAMS software.

Experience in programs such as A380, A350, A320 NEO, A400M, C295 and CN235, Arabian High speed train, CERN and ESA deep Space

SERTEC is currently included as main supplier in Airbus commodity for tests, CERN suppliers, ESA, RENFE.

SERTEC also owns automation and mechatronics department for tooling and test benches. In addition Acquainted with 7th FP has been awarded with projects in the Clean Sky project. SERTEC also participates in projects funded by the CDTI (Spanish governmental research and development centre).

SERTEC is currently composed by 50 engineers established in new facilities in Tecnogetafe with 400m2 engineering office. 800m2 industrial plant (assembly and testing).

Quality management system is certified according ISO 9001, EN 9100, ISO 14001 and PECAL 2110/2310.

## Large scientific facilities and national research facilities contracts:

ESA- X-Band Cryogenic Feed Prototyping. 2015 (on going)

CERN-Provision of civil engineering works. 2013 (on going)

**R&D projects:**

2016- CS2 – PROJECT ASCENT: Active Cockpit Simulator & Ground Station Facility Test Environment Enhancement

2016- CS2- PROJECT FORMIT: Forming and Modular Integration of Thermoplastics

2015- H2020- PROJECT OUTCOME: The outstanding challenge in solid mechanics: engineering structures subjected to extreme loading conditions

2015-INNTERCONECTA- PROJECT AIRUNION- Automatización y robustez en uniones encoladas

2014- CS2- PROJECT TEMGIR- Thermal and electrical Mock-ups for Thermal Management of a Ground Integration Test Rig

2013- INNTERCONECTA- PROJECT VECTURA: Nuevas tecnologías de montaje y pintura en aeroestructuras

2012-CS-PROJECT WISDOM: Wing structural development method

2012-CS PROJECT PROUD: Precission outer wing assembly devices

2010- CDTI- PROJECT ALUA: UAV based on autogiro concept

**Markets:**

Nuclear / Defense / Automotive / Naval / Aeronautics / Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, PECAL 2110, 2310, EN9100


SERTEC headquarters

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|---|---|
| **COMPANY NAME** | **SEVEN SOLUTIONS, S.L** |
| **ADDRESS** | **Calle Periodista Rafael Gómez Montero 2, CETIC-UGR 13, 18014, Granada, Spain** |
| **WEB** | **www.sevensols.com** |
| **TURNOVER** | **875K in year 2015** |
| **EMPLOYEES** | **20 in year 2016** |
| **CONTACT PERSON** | **Miguel Mendez** |
| | **POSITION Senior Engineer and Project Manager** |
| | **PHONE +34 958 285 024** |
| | **EMAIL mmendez@sevensolutions.com** |
| | **SME Yes** |

### Company activities and skills:

Seven Solutions S.L. is a privately held leading company in accurate sub-nanosecond time transfer and frequency distribution for reliable industrial and scientific applications.

With more than ten years of expertise in embedded systems design (electronics, firmware, embedded software), we have already worked successfully in cutting-edge projects at different sectors such as avionics, telecommunications, Smart-Grid, space and scientific facilities as particle accelerators and radio-telescopes.

In collaboration with the CERN we have developed the White Rabbit (WR) protocol. It was articulated with the purpose of being the standard of the new generation of deterministic networks. Its main objective is the deterministic clock distribution and the high accuracy synchronization.

We are experts in custom electronics design, embedded systems programming, electronics production externalization, data acquisition, processing and storing, fast control and system integration and custom timing solutions (timing and synchronization systems, real time signal processing). We have participated on some of the larger scientific facilities in the world providing electronics design, firmware/gateware, control software and support.

### Large scientific facilities and national research facilities contracts:

CERN: White Rabbit Switch Development. 2010. NIC module development 2012. Serializer IP core 2012. White Rabbit fabrication test Suit 2013. White White Rabbit Switches fabrication 2014.

GSI: Electromagnetic compatibility 2013. White Rabbit Switches tender 2014.

IFMIF-EVEDA: In the International Fusion Materials Irradiation Facility our main tasks are the control of acquisition, interlocks and data logger through EPICS & CSS/BOY, the integration of WR protocol to synchronize various LLRF, the characterization and calibration of the ADC/DAC and the creation of a Python testing procedure to check the quality of the components. 2015

KM3Net: It is a cubic kilometer neutrino telescope. Seven Solutions is in charge of the WR switch customization, the PCB design, the production of boards, gateware, firmware... 2016

CTA: It will be the next-generation facility for high-energy gamma-ray astronomy. We provide the WR technology to ensure ultra-accurate time synchronization of the CTA large distributed arrays as well as the time stamping for a clock distributed environment. We also provide Data grabber boards for the different telescopes. 2016

**R&D projects:**

White Rabbit Development. (Industry for Science call 2010). White Rabbit development for timing and synchronization in scientific facilities.

EMC2: Embedded Multi-Core systems for Mixed Criticality applications in dynamic and changeable real-time environments (2015-2017).

BIG DATA high time accuracy for the optimization of the beam positioning integrated system in particle accelerators (2017-2018).

**Markets:**

Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

White Rabbit Zynq Embedded Node Time Provider

White Rabbit switch v 3.4


White Rabbit lite embedded node

softwcare

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|---|---|
| **COMPANY NAME** | **SOFTWCARE S.L.** |
| **ADDRESS** | **Avda. Atlántida 100 1-izq; 36208 Vigo, Spain** |
| **WEB** | **www.softwcare.com** |
| **TURNOVER** | **211,540.00 € in year 2015** |
| **EMPLOYEES** | **4 at Softwcare S.L.** |
| **CONTACT PERSON** | **Patricia Rodríguez Dapena** |
| | **POSITION CEO** |
| | **PHONE +34 986241485** |
| | **EMAIL rodriguezdapena@evercare.com** |
| | **SME Yes** |

**Company activities and skills:**

Softwcare S.L. gather software and system experts with common objectives: provision and support to the use of (new) techniques to verify and validate software in critical applications. Big public or private organisations, as well as industries developing these systems, including small software development companies, in domains like defence, aerospace, aviation, automotive, etc, are the main customers of Softwcare, performing activities in the evaluations of critical software products in particular from the safety and reliability viewpoint.

**Large scientific facilities and national research facilities contracts:**

- MTG ICUs ISVV – Softwcare is the only responsible of performing the ISVV for the critical software of both FCI and IRS ICUs respectively of the Meteosat Third generation satellites for ESA. (Still on-going)
- MTG SMU ISVV – together with SSF, Evercare is performing the ISVV activities for ALL the critical on-board software products controlling the MTG satellite platform. (Still on-going)
- VEGA-2 launcher ISVV. As part of a consortium , the Vega-2 Independent Software Verification and Validation (ISVV) project is targeted to the FPS-A complete on-board control SW, ISVV Level 2. (2015)

Many other ISVV activities: Galileo IOV ISVV, Cryosat-2 ISVV, etc. for ESA.

**R&D projects:**

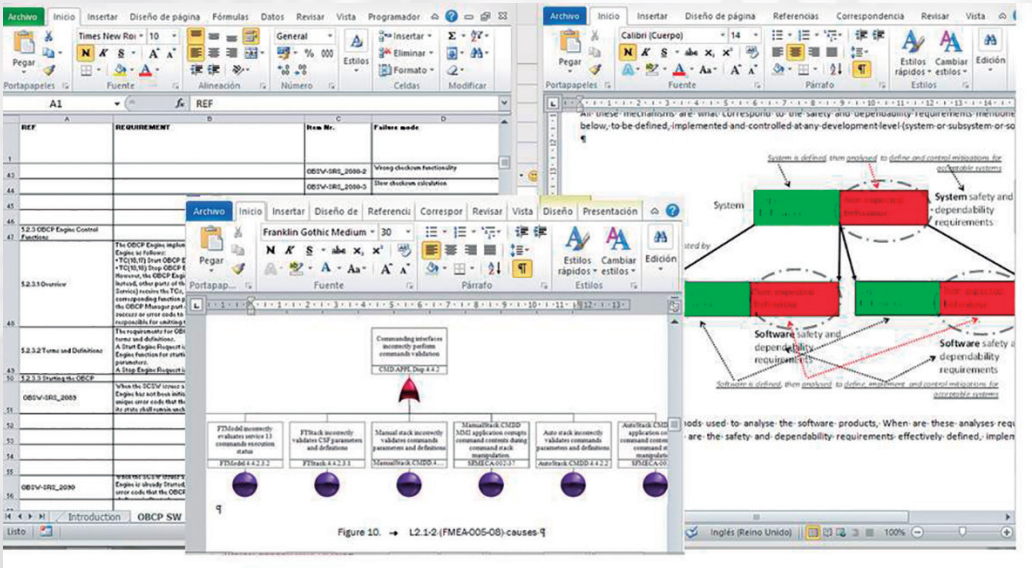
- ESA R&D project to define software fault prevention techniques including Ada, C and C++ coding standards (2016)
- ESTEC TRP project as part of a Consortia to establish the conditions and identify the methods, techniques and tools to be used to ensure prevention of failure propagation between software products and components of different criticality category. It resulted in a 'standard' approach to software failure propagation prevention that can be directly applied in ESA projects. (2011)
- R&D small contract to ESA to define software fault tolerance techniques (2011)
- ESTEC R&D project for the software criticality Software Criticality Classification and Associated Assurance Provisions – led by EADS (2007)

**Markets:**

Automotive / Aeronautics / Space /

**Quality certifications, nuclear qualifications:**

ISO 9001




Sample Softwcare safety and dependability analyses

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| **COMPANY NAME** | **TAIM WESER S.A.** |
| **ADDRESS** | **Carretera de Castellón Km. 6,3 – Pol. Ind. La Cartuja – 50.013, Zaragoza (Spain)** |
| **WEB** | **www.taimweser.com** |
| **TURNOVER** | **51,386,490 € in year 2015** |
| **EMPLOYEES** | **285 in year 2017** |
| **CONTACT PERSON** | **Eduardo Francés** |
| | **POSITION Manager Cranes Business Unit** |
| | **PHONE +34 976 500 006** |
| | **EMAIL efrances@taimweser.com** |
| | **SME No** |

### Company activities and skills:

TAIM WESER has been supplying state-of-the-art high capacity and responsibility bridge and gantry cranes as well as bulk materials handling plants for more than 100 years.

TAIM WESER supply its products paying close attention to the specific requirements requested by their customers and always based on the principles of safety, high performance, precision of movement, low maintenance and operation costs and maximum availability.

All essential processes of design and fabrication are carried out and supervised in TAIM WESER's facilities and additionally, all the cranes are assembled and tested in our factory, with or without load attending to client specifications. This process leads us to the achievement of a final product of high quality and an absolute assurance that no major unforeseen problems occur during assembly on site.

In the nuclear generation industry, we are leading supplier of special EOT and gantry cranes for the handling of low and intermediate active nuclear waste as well as nuclear fuel. Our experience in the nuclear sector started in 1965, when we supplied cranes to Jose Cabrera's Nuclear Power Plant, the first plant installed in Spain. Following this project we have supplied further both national and international nuclear plants and today we have presence in large scale projects as the Technological Building (TEC) of the Chernobyl New Safe Confinement Project.

In the Oil and Gas sector, specifically in the petroleum coke process sub-sector, the customer's high productivity levels requires that the equipment installed there has to be ready to work continuously and only stop when the customer decides to carry out scheduled shutdowns. We supply fully integrated systems for handling petroleum coke at refineries and allow our customers with a technological solution from a single supplier, all the way from the output of the coke from the production towers to its final dispatch. Furthermore we take responsibility for the entire in-house coke transport and storage system, thus freeing the customer of the need to overcome complex interfaces that always cause errors and delays.

### Large scientific facilities and national research facilities contracts:

- Organisation: ALBA – Year: 2006

Scope of supply: TAIM WESER supplied 2 Orbital bridge cranes with 12 t capacity and 33 m. span in the Experimental Hall of the ALBA Synchrotron Light facility.

-Organisation: CERN. Phase 2 – Year: 2003

Scope of supply: TAIM WESER supplied an EOT crane for the assembly process of the detector

inside the cavern.

-Organisation: CERN. Phase 1 – Year: 2000

Scope of supply: TAIM WESER supplied 2 gantry cranes with 80 tons of capacity for the assembly and lowering of the detector at the Large Hadron Collider (LHC). The main characteristic of the cranes was a lifting height of 115 m, necessary to the lowering process of the detector to the cavern.

**R&D projects:**

TAIM WESER is specialized in the development of high technological degree tailor made projects all around the world. We ensure the best fulfilment of the whole projects through our design, manufacture, delivery, commissioning and after sales departments.

TAIM WESER is an international point of reference and is able to offer their clients the most advanced and, at the same time, the most competitive solutions.

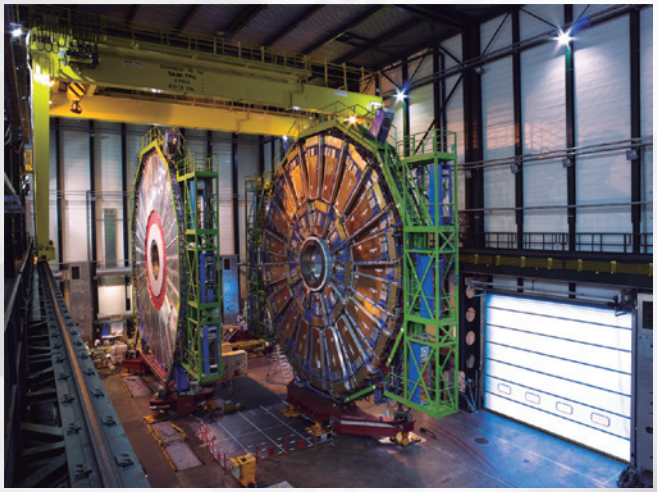
TAIM WESER is interested in large mobile structures projects related to high capacity bridge and gantry cranes as well as stockyard and conveying machinery.

**Markets:**

Nuclear / Energy / Oil&gas / Steel Industry

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, OHSAS 18001



CERN gantry crane


ALBA Orbital cranes

**COMPANY NAME** THALES ALENIA SPACE ESPAÑA, S.A.
**ADDRESS** Einstein 7, 28760, Tres Cantos (Spain)
**WEB** www.thalesaleniaspace.com
**TURNOVER** 71 M€ in year 2016
**EMPLOYEES** 325 in year 2016
**CONTACT PERSON** Ángel Álvaro
**POSITION** R&D Manager
**PHONE** +34 918 077 977
**EMAIL** angel.alvaro@thalesaleniaspace.com
**SME** No

### Company activities and skills:

Thales Alenia Space Spain is the country's leading space company in export markets, with over 28 years of experience in the design, development and sale of advanced space systems and equipment. The company has contributed to more than 500 satellites, space probes and vehicles used in telecommunications, Earth observation, science, exploration, navigation and orbital infrastructure missions. Investing some 12% of sales in R&D, Thales Alenia Space Spain offers a wide range of solutions spanning the design and integration of payloads and subsystems for telecommunications, data transmission and TT&C (tracking, telemetry and command), optical observation instruments, radiofrequency equipment, data processing and digital electronics, and network management systems for the ground segment.

Thales Alenia Space Spain has a solid background in designing, manufacturing and testing critical systems for space applications devised to survive the harsh thermal and radiation environment of outer space and planetary missions. This background comprises a deep knowledge of the effects of radiation on electronic components as well as RAMS assesments for data processing and robotic systems.

### Large scientific facilities and national research facilities contracts:

IAA-Main Electronics Unit (MEU) For the Plato Mission Instrument (ESA)-2017

ESA- ExoMars Rover Actuator Drive Electronics -2016

ESA- Scallable Sensor Data Processor (SSDP) Development of a rad hard MPSoC chip for sensor data processing-2016

ESA – Sentinel 3 satellite Radiation Analysis Responsible-2015

ESA-JUICE Mission to Jupiter : Radiation and Charging Analysis for B2 phase – 2015

### R&D projects:

H2020-VEGAS: Verification and Radiation Tests of High Capacity European FPGA-2017

H2020-CERBERO: Cross-layER multi-oBjective design EnviROnment for critical cyberphysical systems-2017

ECSEL-AQUAS: Aggregated Quality Assurance for Systems-2017

H2020-I3DS: Integrated 3D Sensors suite-2017

### Markets:

Space

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001

Thales Alenia Space España premises in Tres Cantos, Madrid.

Thales Alenia Space España has a complete 1700m$^2$ ISO 8 cleanroom for manufacturing and test

Thales Alenia Space España Optical Laboratory (ISO5) for instrument integration and test

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|---|---|
| **COMPANY NAME** | **FUNDACIÓN TECNALIA RESEARCH & INNOVATION (TECNALIA)** |
| **ADDRESS** | **Parque Tecnológico de Bizkaia, c/Geldo, Edificio 700, 48160 Derio Bizkaia (Spain)** |
| **WEB** | **www.tecnalia.com** |
| **TURNOVER** | **100,398,651 in year 2015** |
| **EMPLOYEES** | **1285 in year 2016** |
| **CONTACT PERSON** | **Hugo Martínez-de-Lahidalga Fernández** |
| | **POSITION Estrategia de Desarrollo de Negocio y SG** |
| | **PHONE +34 664 359 613** |
| | **EMAIL hugo.martinezdelahidalga@tecnalia.com** |
| | **SME No** |

**Company activities and skills:**

TECNALIA (www.tecnalia.com) is the product of the merger in 2010 of eight technology centres, some of which had up to 55 years of history. Currently it is one of the most important private applied research centres in Spain and Europe.

TECNALIA offers products and technological solutions for scientific Infrastructures and Science Industry in the following areas:

Construction and Environment

- Support the design of new facilities and physic infrastructure (locations selection, environmental design for the facilities,mobility impact, best environmental practices).
- Contribution to the civil work of singular features.
- Infrastructure management, control and maintenance.

Energy Efficiency

- Design and development of power electronics equipment.
- Control systems for power converters, and IGBT's.
- Superconductivity: magnets, motors, cryogenics …

Advanced Materials and Processes

- Development of new materials and their characterization in extreme conditions.
- Heat treatments and surface coatings and conservation.
- Welding process (brazing, soldering).

Control, data access, communication and remote handling

- Autonomous navigation systems.
- Handling systems based on parallel kinematics.for Remote handling.
- Complex data analysis and knowledge management: Data acquisition &.Data Mining.

Testing and Certification

- Testing and Certification of electrical equipment.
- Assessment of materials and components behaviour against corrosion phenomena, stress, fatigue, etc.
- Conformity evaluation of electrical equipment, diagnosis and maintenance of equipment in facilities and supplier qualification.
- Chemical characterization, metallurgical and mechanical.

- NDT (Non Destructive Test) and special test.

**Large scientific facilities and national research facilities contracts:**

F4E, F4E-OFC-618. Provision of destructive and non-destructive testing of materials at room and elevated temperatures. 2016

CERN IT-4191/TE/HL-LHC. Quadrupole Corrector First-of-a- kind for HL-LHC (QUACO Pre-commercial Procurement). 2016

ECMWF. Copernicus_C3S_52. Evaluation and Quality Control Function for the Sectoral Information Systems. 2015

ESA. Citric Acid as a Green Replacement for Steels Passivation. 2015

**R&D projects:**

| Role | Acronym | Title | ID | Programme | Start date |
|---|---|---|---|---|---|
| Coord | SIDER | Radiation shielding of compo-site space enclosures | 262746 | FP7-SPACE | 01/12/2010 |
| Coord | SMARTEES | Multifunctional components for agressive enviroments in space applications | 262749 | FP7-SPACE | 01/01/2011 |
| Coord | ROV-E | LIGHTWEIGHT TECHNOLOGIES FOR EXPLORATION ROVERS | 262744 | FP7-SPACE | 01/01/2011 |
| Part | HarmLES | Dry lubricated Harmonic Drives for space applications | 263162 | FP7-SPACE | 01/06/2011 |

**Markets:**

Defense / Automotive / Aeronautics / Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, UNE-EN 9100 Aerospace Certification, ISO 17020

Vacuum tank in the laboratory for advanced surfaces

**COMPANY NAME** TECNATOM S.A.
**ADDRESS** Avenida Montes de Oca, 1, San Sebastián de los Reyes 28703, Madrid (Spain)
**WEB** www.tecnatom.es
**TURNOVER** 122 M€ in year 2015
**EMPLOYEES** 1.071 in year 2015
**CONTACT PERSON** Pierre Boulogne
**POSITION** Account Manager
**PHONE** +34 916 598 553 / +34 616 635 785
**EMAIL** pboulogne@tecnatom.es
**SME** No

## Company activities and skills:

Tecnatom was set up in 1957 as a Spanish engineering company specialising in guaranteeing the operation and maintenance of nuclear power plants to the highest levels of safety.

The company supplies services and products with a high technological content, frequently designed and developed in- house, tailored to the needs and requirements of the different clients and markets and possessing state-of-the-art mechanical, electronic and data-processing design resources and programmes.

Nowadays, Tecnatom is an International business group with subsidiaries in USA, France, China, Brazil, Mexico and Emirates carrying out projects in more than 40 countries worldwide. The Company has adapted its technological capacities to a very demanding environment, contributing with innovative solutions to the global energy challenge.

Tecnatom as an engineering services company, devoted to the inspection, testing and training services to nuclear power plants, has been involved in the European Fusion programme providing support in the field of Non Destructive Testing, Remote Handling, Robotics activities, Nuclear Safety, and Simulation of processes.

The main contracts won are shown in the box below.

## Large scientific facilities and national research facilities contracts:

- Framework services contract: Remote Handling Maintenance Engineering Services (IO/15/CT/6000000169), signed with ITER Organization. 2015.

- Development of manual guided scanners for ultrasonic inspection of welds for ITER vacuum vessel assembly of sectors and ports (subcontracted by ENSA, as part of contract ITER/12/4300000724, 2012).

- Development of ultrasonic inspection procedures and manual guided scanners for the inspection of Toroidal Field Coil cases welds (subcontracted by SIMIC, S.p.A., as part of contract F4E-OPE-414: Supply of the ITER TF COIL Cold test and Coil Insertion).

- Development of ultrasonic inspection procedures and manual guided scanners for the inspection of ITER Vacuum Vessel welds (subcontracted by Ansaldo Nucleare-Mangiarotti-Walter Tosto, as part of contract F4E-2010-OPE-068: Supply of seven vacuum vessel sectors. 2010.

- Development of ultrasonic inspection procedures for the inspection of precompression rings (subcontracted by EADS Casa Espacio as part of contract ITER-F4E-OPE-345).

- Development of ultrasonic and visual testing inspection procedures for DEMO (subcontracted by CIEMAT, as part of contract WPRM-AWP2015-RM-5-1-3-T001 NDT technology development). 2016.

- Multiple Framework Supply contract in cascade (F4E-OMF-383-02). Signed with F4E, 2015.

- ITER-NBI: RH Studies and interfaces (subcontracted by CIEMAT). 2007-2008.

- ITER: Workshop on Safety Culture Campaign – External communication on safety related topics (contract signed with ITER Organization, 2014).

- ITER: Workshop on implications of presentation of safety related issues in publications and conferences (contract signed with ITER Organization, 2014).

- Safety Culture Survey of the ITER Organization (contract signed with ITER Organization, IO/CT/4300000993, 2013).

**R&D projects:**

Advanced manufacturing technology for science industry. Application in the field of fusion (FUSION TECHNOLOGIES). National research project, funded by CDTI. EXP 00081275 / IDI-20151084.

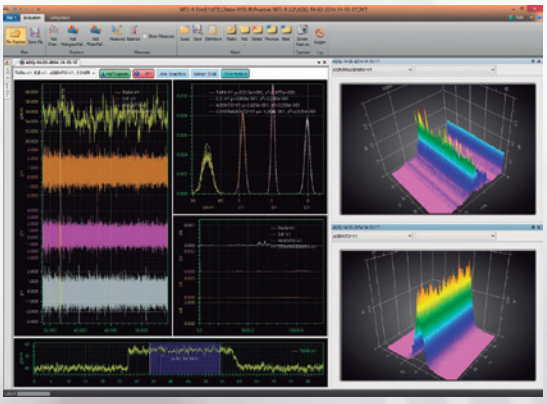
**Markets:**

Nuclear / Defense / Aeronautics / Space / Energy / Oil&gas

**Quality certifications, nuclear qualifications:**

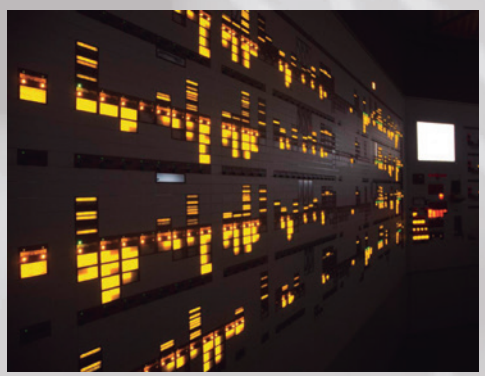
ASME, ISO 9001, ISO 14001, CEFRI, ISO 17025, INPO, EPRI

Training services



NDT Solutions

Robotic Solutions



I&C Solutions

**COMPANY NAME** TECNOBIT
**ADDRESS** C/ Marie Curie, 19 28521 Rivas-Vaciamadrid (Madrid) Spain
**WEB** www.tecnobit.es
**TURNOVER** 57,089,750€ in year 2016
**EMPLOYEES** 350 in year 2016
**CONTACT PERSON** Juan Carlos Castellanos
**POSITION** Business Development Manager
**PHONE** +34 916 617 161
**EMAIL** juancarlos.castellanos@tecnobit.es
**SME** No

## Company activities and skills:

- TECNOBIT is a Spanish company which started its activities in 1976. The company is devoted to provide Design, Development, Manufacturing and Testing of Electronic Equipment for Aerospace & Defense Market

The main business áreas are:

- Aeronautic / Aerospace
- Command Control Communications & Crypto (C4I)
- Opto-Electronics
- Simulation and Support Systems

Within the Aerospace & Defense market, TECNOBIT has been part of several large and important international programmes with a set of first world level actors that are today part of our customers base. Some examples of this are:

- Eurofighter Typhoon: TECNOBIT is involved in five flight equipment and two ground equipment
- A-400M: TECNOBIT supply the Audio Management System (AMS) as well as the MIDS Interface Computer (MIC) for this AIRBUS programme
- Dutch Navy: TECNOBIT provides the Data Link Multi-Processor called LINPRO already in use (also in the Spanish Navy)
- HISPASAT HAG1: TECNOBIT has supplied the overall electronics for the Satellite Antenna. In this case the electronics perform the interfacing processing and control and also the power supply for the unit

In summary, the main capabilities for Large Scientific Programmes that TECNOBIT can provide are:

- Real Time Processing Electronics
- Specific Power Supply Electronic Systems
- Secure Communications
- Test Benches and Support for Equipment Life Cycle

## R&D projects:

- SISCOM Programa Avanza: UAV Auto Pilot System (2013)

The aim of the programme was the development of an Unmanned Aircraft Control System including the capability to work in compliance with:

- Aerial Traffic Management Systems
- Payload Control Systems
- UAS General Monitoring System

- EBOX: Clean Sky: Lightweight Composite Bus System Housing for Extreme Environments (2012)

In the frame of Clean Sky initiative, TECNOBIT was involved in this project which aim was the evolution of the avionics housing to a new based on new materials trying to ensure that the overall required skills (EMI/EMC, mechanical, etc.) remains valid for flying. Basically, TECNOBIT was responsible for the housing design and the development and execution of the test plans for demonstration.

- PRESENCE PID CDTI: Design and Development of Galileo PRS service receiver (2013)

In the frame of the Galileo as the new GNSS European Satellite Constellation, the most critical and important service to be provided is the Public Regulated Service (PRS). PRS will be provided for specific user communities as Security Forces, Civil Protection, Defence or SAR service, and it is protected as EU-SECRET environment, so a totally new generation of PRS receivers was required. In this frame, TECNOBIT worked in consortium with GMV (Spanish main actor for GNSS) in this project called PRESENCE in which was developed the first PRS laboratory receiver. Today, PRESENCE PRS receiver is a reality and just entered in a new phase of the development.

- HISPASAT HAG1 INTERFACE CONTRUL UNIT (ICU) AND POWER SUPPLY UNIT (PSU) (2012)

TECNOBIT has developed the ELSA Antenna electronics control unit. The aim is to monitor, control and process the overall signals and information in the SAT Antenna through the ICU system. Moreover, the PSU provides also the power needed for the overall system. The satellite has been launched early 2017

**Markets:**

Defense / Naval / Aeronautics / Space

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, EN9100, EN9110, PECAL / AQAP-2110/2310

AIRBUS A400-M AMS

Eurofighter FLIR

| | |
|---|---|
| **COMPANY NAME** | **TEKNOSERVICE S.L.** |
| **ADDRESS** | **Avda. Albaida 1, P.I. PIBO Bollullos de la Mitación (Sevilla), Spain** |
| **WEB** | **www.teknoservice.es** |
| **TURNOVER** | **19,3M€ in year 2015** |
| **EMPLOYEES** | **96 in year 2015** |
| **CONTACT PERSON** | **Blanca Iturmendi** |
| | **POSITION CEO** |
| | **PHONE +34 954 541 212** |
| | **EMAIL blanca.iturmendi@teknoservice.es** |
| | **SME No** |

### Company activities and skills:

Teknoservice is a 100% Spanish owned company with more than 25 years of experience in the new technologies sector. We provide comprehensive solutions while taking great care to ensure the quality and excellence of our services.

The fact that we have become a benchmark company for the ICT sector, and the high standard services that our team provides to each of our customers are testimony of our position as market leader.

Under our TTL brand, we use cutting edge technology to produce a wide range of professional desktop computers, laptops, tablets, workstations, servers and massive storage enclosures. Our products are constantly monitored and updated by the engineering and networking laboratory, which manages the R&D projects. Every single one of our products is tested thoughtfully during at least 8 hours. Our broad IT solutions portfolio includes our own developed tailored operating system and desktop virtualization infraestructure.

Teknoservice´s comprehensive technology maintenance service and our worldwide authorized service centers network allow our IT equipment and solutions to be kept up to date and operational at all times.

Teknoservice is the only Spanish CERN supplier for servers, massive storage systems (+30 Petabytes) , high performance desktop PCs (supply contract, more than 3000 PCs among 3 years) and the only one provider of NUCs computers for CERN to date.

Teknoservice is a company committed to the society and environment, having multiple certifications guarantying its compromise. It also contributes with various cultural associations and entities. Our strong position in favor of quality and professional products is in our DNA. We developed a work methodology that distinguish us from others, offering an unprecedented level of personalization while covering all the requisites of our clients. This work model gives to Teknoservice a very high level of loyalty from its clients.

### Large scientific facilities and national research facilities contracts:

CERN IT-4107/IT - 350 Ultracompact high performance NUC Computers - 2016

CERN IT-3993/IT - 30 Petabytes Storage Enclosures for the High Performance Computing facility at Budapest - 2014

CERN IT-3840/IT - 3.000 High Performance Computers - 2013

**R&D projects:**

TTL O.S., is a GNU/Linux based system tailored to our clients' needs with a focus on embedded devices and thin clients. It is extremely lightweight and modular and features a complete ecosystem. This Operating System is not base under any other Linux Distribution, is working on more than 40.000 machines used by the biggest public and private companies in our country. This project was proposed to participate in CERN's OpenLAB. One of the main values for this product is its security: With a very low attack surface, and high frequency updates.

TTL V.D. is a VDI and IaaS system inspired by the same philosophy behind our TTL O.S. project: very lightweight, completely open source and highly customizable solution. This is how this system distinguishes itself from others: Highly available from the start, agent/client less, lightweight, GPU Accelerated. As TTL O.S. every single aspect of the product is minded with security: Any communication is secured by high quality TLS encryption.

ARM Thin Clients: This is our third generation of ARM thin clients, inspired by the same standards as our other projects: Energy efficient, cost effective, true 64bits machine and hardware virtualization, desktop capable.

Panoramik: is a complete solution to support "good management" legislations. Capable of streaming multiple sources, 180º HD video recording and with one button operation, scheduled recordings, and plays well with the audio systems that are already in place.

**Markets:**

Defense / Automotive / Aeronautics / Energy / Financial Institutions, Government and Main Public

**Quality certifications, nuclear qualifications:**

ISO 9001, ISO 14001, ISO 27001, Epeat GOLD, Energy Star.

Logistics

Plates

| | |
|---|---|
| **COMPANY NAME** | **TSK ELECTRÓNICA Y ELECTRICIDAD, S.A.** |
| **ADDRESS** | **Ada Byron, 220 / 33203-Gijón, Spain** |
| **WEB** | **www.grupotsk.com** |
| **TURNOVER** | **865 M€ in year 2016** |
| **EMPLOYEES** | **1010 in year 2016** |
| **CONTACT PERSON** | **Jose Ignacio Martí Sempere** |
| | **POSITION Sales Manager** |
| | **PHONE +34 670 736 796** |
| | **EMAIL joseignacio.marti@tsk.es** |
| | **SME No** |

**Company activities and skills:**

Engineering, Procurement and Construction of Industrial Plants

Engineering, Procurement and Construction of Energy (Conventional and Renewable) Plants

Engineering, Procurement and Construction of Electrical Infrastructures

Engineering, Procurement and Construction of Water Treatment Plants

**Large scientific facilities and national research facilities contracts:**

ESO ALMA 17 MW Multifuel power Plant / Year 2011

**R&D projects:**

**Markets:**

Energy

**Quality certifications, nuclear qualifications:**


ALMA Multifuel Power Plant (2011)

| | |
|---|---|
| **COMPANY NAME** | **TTI NORTE S.L.** |
| **ADDRESS** | **C/ Albert Einstein 14, 39011 Santander (Spain)** |
| **WEB** | **www.ttinorte.es** |
| **TURNOVER** | **8 M€ in year 2016** |
| **EMPLOYEES** | **80 in year 2016** |
| **CONTACT PERSON** | **Miguel Peña** |
| | **POSITION Commercial** |
| | **PHONE +34 942 291 212** |
| | **EMAIL mpena@ttinorte.es** |
| | **SME Yes** |

**Company activities and skills:**

TTI works in the technological forefronts of space, military, telecommunications, science, and information technology sectors. TTI designs equipment in the radiofrequency and antenna technology area developing new products (detailed design, prototyping, testing and validation) for its later mass production, as well as integrating complex communication systems, providing turnkey solutions.

For Particle Physics activities, the main areas of expertise are:

– Solid State Power Amplifiers: based on LDMOS Solid State Technology, up to tens of kWs and covering a wide range of frequencies. The equipment is developed according to reliability, technical efficiency and lower cost criteria

– RF Passive Devices: For any devices, TTI develops conceptual, detailed and manufacturing designs, Quality Control Protocol design according to operating conditions and Operation Testing design

- Development of waveguide components for Multi-Megawatt Particle Accelerators and for a lot of applications in Ultra-High Vacuum conditions at different working frequencies (S, C, and X Band)
- Coaxial High Power Coupler for RF Cavities
- High Power Test-Box RF Cavities for RF coupler conditioning (Capacitive & Inductive)
- Coaxial Power Combiner
- RF cavities for linear accelerator both normal conducting and super conducting designed to work both in CW and pulsed mode operation.

For Astronomy activities, the main areas of expertise are:

- Design and manufacturing of Cryogenic low Noise Amplifiers
- Design and manufacturing of Low Noise, Highly Integrated Receivers for Cryogenic and Un-cooled applications
- Design and manufacturing of Wideband Feeders for antenna dishes
- Cryostats (reconfigurable and tailor made)

**Large scientific facilities and national research facilities contracts:**

[ALBA] Driver SSPAs 500W @500MHz (2016, 2015)

Narrow bandwidth SSPA drivers to be used in ALBA synchrotron.

[CERN] Driver amplifiers (Qty. 312) of the new power amplifier for the SPS 200 MHz RF system (2014)

Big number of high performance SSPA driver amplifiers to upgrade de SPS (Super Proton Synchrotron) which is the last accelerator in the chain of accelerators that supplies the proton beams to the LHC.

[ESO] Cryogenic LNAs for ALMA observatory bands 5, 7 and 9 (2014, 2009, 2007)

Close to eight hundred units of cryogenic LNAs manufactured so far by TTI for ALMA observatory in Chile, in [4-8] GHz and [4-12] GHz frequency bands.

[ESA/ESOC] Ka band SSPA 100W for ESA Deep Space Stations (2014)

Future deep space missions will require the presence of a Ka band uplink and downlink to increase throughput between ground station and spacecraft, for radio science (RSE) applications and for more accurate navigation and orbit determination.

[IRAM] Cryogenic LNAs, for NOEMA and NIKA2 receivers (2014)

[VIRAC-VENTSPILS] Development, installation, tests and training of receiver systems for radio-telescopes RT-16 & RT-32 (2012)

Design and manufacturing full receivers (Qty 2), including antenna feeder, cryostat integrating cryogenic LNAs, vacuum system, monitoring & control, etc. as well as installation and commissioning.

[CIEMAT] Design and manufacturing of Test Bench for High Power RF coupler conditioning (2012)

[CIEMAT] Design and manufacturing of the prototype RF chain for IFMIF/EVEDA (2011)

Detailed design and Prototyping of RF modules for 105 kW and 230 kW configurations, including mechanical and cooling design, as well as Tetrode protection circuits.

**R&D projects:**

[CDTI] LOCATION – Innovative developments of low cost high power amplifiers for scientific installations (2015)

[CDTI] ICH15 - Design of a proton accelerator with CH/IH type structure for radioactive isotopes production and and uveal tumor treatment (2015)

[CDTI] Critical Technologies Development of Amplifier, LLRF and Coupler subsystems for the ESS (2014)

[CDTI] GASP- Superconducting Gantry development for proton therapy (2013)

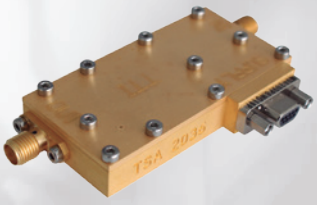
[CDTI] ACELTEC - Design and development of High-Gradient Superconducting RF Cavities for Particle Accelerator Applications (2012)

**Markets:**

Defense / Aeronautics / Space

**Quality certifications, nuclear qualifications:**

ISO 9001



S band Cryogenic Low Noise Amplifier

1,25KW Solid State Power Amplifier at 200MHz

**COMPANY NAME** THE VACUUM-PROJECTS, S.L.U.
**ADDRESS** Velluters, 17 Parc Empresarial Tactica 46988 Paterna (Valencia), Spain
**WEB** www.vacuum-projects.net
**TURNOVER** 1,500,000 € in year 2015
**EMPLOYEES** 16 in year 2015
**CONTACT PERSON** José Gómez Fernández
**POSITION** General Manager
**PHONE** +34 961 344 831
**EMAIL** j.gomez@vacuum-projects.net
**SME** Yes

## Company activities and skills:

THE VACUUM PROJECTS is specialized in design, manufacturing, assembly, testing and integration of systems where are involved high vacuum and cryogenics technology.

Key activities:

- Design, 3D CAD
- Quality control
- Engineering
- Manufacturing: Mechanical, welding (TIG, MIG, EBW, Vacuum Brazing)
- Assembly
- Leak , vacuum and dimensional control testing
- Ultrasonic cleaning
- Clean room for assembly

Our wide knowledgment in designing and manufacturing of vacuum chambers, cryostats and mechanical systems in different sizes and materials (stainless steel, aluminium, copper, niobium, tantalum,...) makes affordable whatever project our customer needs. In our in-house 1000 m2 floor manufacturing facilities (CNC machining lathe, milling machines, welding, adjust & assembly section, ultrasonic cleaning and dimensional control) we can take part of main activities of the projects we made, assuring quality control of our deliveries.

We supply a wide number of references from our catalogue of vacuum components and vacuum pressure gauges, offering our customer solutions for their requirments.

Since our foundation in 2006, our company has participated in projects with main National and International Research Centers such as CERN, ESO, ESA, ESRF, ALBA, CIEMAT, CSIC, INTA being a well reconigzed company in this R&D centers. Expertise achieved in all this years makes of The Vacuum Projects a confident partner for developing state of art vacuum and cryogenics systems.

## Large scientific facilities and national research facilities contracts:

[CERN] HIE ISOLDE Diagnostic Boxes [2016]

[ALBA Synchrotron] Supply of Front end for experimental line 20-LOREA (Part 2 Mobile Masks) [2016]

[ESS-Bilbao] Manufacturing Three Resonant Cavities BUNCHER for MEBT [2016]

[Instituto Astrofísico de Canarias] Manufacturing and supply of a cryostat for Testing Infrared Detectors [2016]

[CERN] Helium Vessel Cryostat [2015]

[CIEMAT] Supply and assembly of components for aconditioning a clear room [2014]

[Laboratorio Procesado de Imágenes (Universitat de Valencia)] Supply, manufacturing and assembly of mechanical structure (EM), collimator, (C) and passive shield (EP) for instrument MXGS of mission ASIM [2014]

[INTA] Cryostat for Testing 50 kg samples to 4 K [2013]

[Centro Nacional de Aceleradores] Soporte de muestras con control remoto (RADLAB) [2012]

[CIEMAT] Supply and manufacturing of 105 units set of superconducting magnets for main lineal accelerator of European XFEL [2011-2015]

[European Southern Observatory] Helium Lines for ALMA [2011]

[Instituto de Física Corpuscular (CSIC-UV) ] Beam Position Monitor Prototype [2010]

[Instituto Astrofísico de Canarias] Cryostat and Optical Bench for EMIR instrument for Gran Telescopio Canarias (GRANTECAN) [2008-2012]

**R&D projects:**

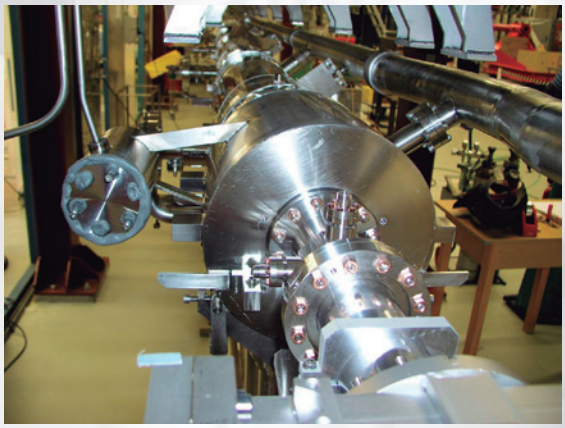
[IFIC UV-CSIC] Development of a prototype Stripline Kicker or the Clic Damping Ring at CERN 2010

**Markets:**

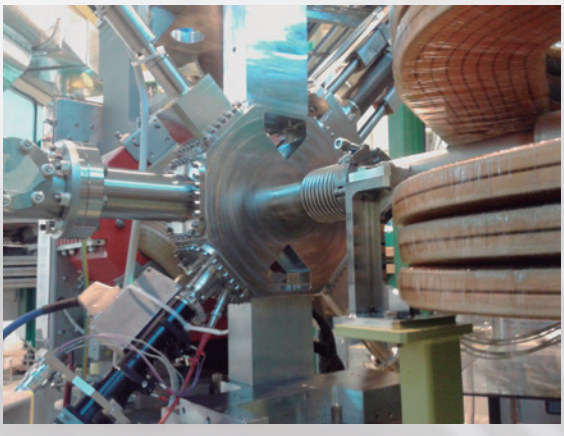
Aeronautics / Space / Energy

**Quality certifications, nuclear qualifications:**

ISO 9001



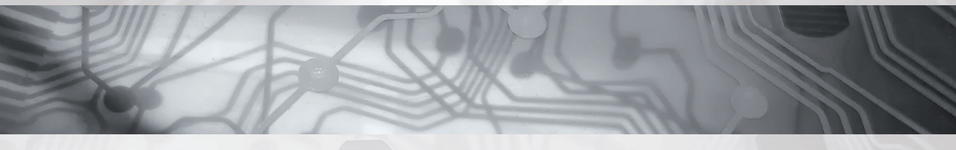
[CIEMAT] Set of superconducting magnets for main lineal accelerator of European XFEL, 2011 – 2015.



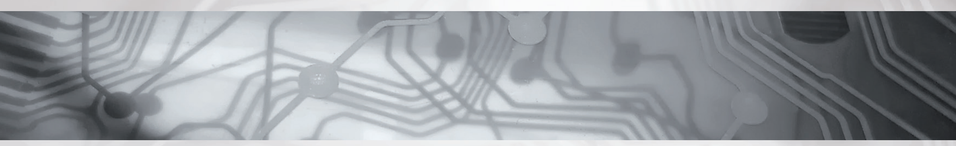
[CIEMAT] Set of superconducting magnets for main lineal accelerator of European XFEL, 2011 – 2015.

# TECHNOLOGY MATRIX

| | TTI | TSK | THE VACUUM-PROJECTS | THALES ALENIA SPACE ESPAÑA, SA | TENDSERVICE | TECNOBIT | TECNALIA | TAIM WESER S.A. | SOFTWCARE | SENER SOLUTIONS SL | SARTEC SL | SENER INGENIERÍA Y SISTEMAS | SCIENTIFICA INTERNATIONAL SL | RAMEM | PROCON SYSTEMS | PROACTIVE R&D | OREP ELECTRIC MACHINES S.L. | NORTEMECANICA SA | NATEC | METROMECANICA SL | LIDAX | LEADING METAL MECHANIC SOLUTIONS, S.L. | JEMA ENERGY SA | ITMA MATERIALTECNOLOGY | ISDEFE | INTEGRASYS SA | INTARCON | INYSTE SA | INGEMETAL SA | INGECIBER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TRAINING** | | | | | | | | | | ● | | | | | | | | | | | | | | ● | | | | ● | ● |
| **ENGINEERING** | | | | | | | | | ● | ● | | | | | | | | | | | | | | | ● | | | | |
| Data Processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mechanical | | | | | | | ● | | | ● | ● | | | | | ● | | | ● | | ● | | | ● | | | | ● | ● |
| Electrical | | | | ● | | | | | | | | ● | | | | | ● | | | | | | | | | | | | |
| Opto-mechanical Engineering | | | | | | | | | | | | ● | | | | ● | | | | | ● | | | | | | | | |
| Optical Engineering | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | ● | |
| Electrical/Mechanical Engineering | | | | | | | | | | ● | | ● | | | ● | ● | ● | | | | | ● | | | | | | | |
| Opto-electronic Engineering | ● | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Management | | | | | | | | | | | | ● | | | | | | | | | | | | | ● | | | | |
| Architect,Civil Engineering | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | ● |
| Scientific Research | | | | | | | | ● | | | | | | | | | | | ● | | | | | | ● | | | | |
| **CONSTRUCTION (BUILDING & ROAD)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Preparation (site- and earthworks) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Steel structures | | | | | | | | | | | | ● | | | | | | | | | | ● | | | | | | ● | |
| Heating, cooling, Ventilation, Air conditioning | | | | | | | | | | | | ● | | | ● | | | | | | | | | | | ● | | | |
| Compressed air | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water supply and treatment | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Elec.+power supply, wind/solar | | ● | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Roads | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| **ELECTRICAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control and communication Cables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Switchgear and Switchboards | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Conductors and Supplies, Cables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement and Regulations | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Supply Components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Maintenance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ELECTRONICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Supplies - Transformers | | | | | | | | | | | | ● | | | | | | | | | | ● | | | | | | | |
| Circuit Boards | | | | | | ● | | | | ● | | ● | | | | | | | | | | | | | | | ● | | |
| RF and Microwave Components and Equipments | ● | | | ● | | | | | | | ● | ● | | | | | | | | | | | | | ● | | | | |
| Functional Modules and Crates | | | | | | ● | | | | | | ● | | | | | | | | | | | | | | | | | |
| Measuring Instruments | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| Passive Components | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Active Components | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| **MECHANICS** | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | |
| Raw Materials | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Equipment/Tools (machine tools, welding, portable/special tools...) | | | | | | | | | | | ● | | | ● | | | | | | | | | | | | | | | |
| Manufacture and Supply of Produce | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Standard production items General machining | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | |
| Casting + molding, forging | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Welding, precision welding | | | | | | | | | | | | | | ● | | | | | | | | | ● | | | | | | |
| Sheet metal work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Custom made pcs | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | |
| Precision Machining Work and Supply of Produce | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Custom made pcs | | | ● | | | | | | | | | | | | | | ● | | | | ● | | | | | | | | |
| Standard production items | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spark erosion machining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Specialized Manufacture | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Combined technology assemblies | | | ● | | | | | | | | | | | | | | | | | | ● | | | | | | | ● | |
| Working of spec. metal/alloys | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | |
| Heat treatment,surface treatmt | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibreglass, composite, plastic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ceramics moulding + machining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **INFORMATION TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hardware (comms, computers, workstations) | | | | | ● | | | | | ● | | | | | | | | | | | | | | | | | | | |
| Storage Systems | | | | | ● | | | | | | | | | | | | | | | | | | | ● | | | | | |
| Data communication | | | | | | | | | | ● | | | | | | | | | | | | | | ● | | | | | |
| Software (PLC, development, CAD/CAM, FEM, etc.) | | | | | | | | | | ● | ● | ● | | | ● | | | | ● | | | | | ● | | | | | ● |
| Consultancy (maintenance, outsourcing) | | | | | | | | | | | | | | | ● | | | | | | | | | ● | | | | | |
| **OPTICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Opt. glass, blanks, crystals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mirrors, prisms, filters, fibres, devices, lasers, etc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optical Treatment of Material, coating | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacturing of Opto-Mechanical Devices | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory Equipment - Positioning Equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optoelectronic detectors and components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Photo/Film Equipment, Materials and Consumables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **VACUUM AND LOW TEMPERATURE TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cryost.,chambers,vessels-cstmd | ● | | ● | | | | | | | | | ● | | | | | ● | | | ● | | | | | | | | | |
| Pumps,pump-syst.,leak detector | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tubes,seals,fittings,stdd.comp | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control systems, measurement instrument, gauges | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Refrigeration equipment | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | |
| Storage+handling cryogenic liquids | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **TRANSPORTATION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hoisting gear,cranes,lifts,etc | | | | | | | | ● | | | | | | | | ● | | | | | | | | | | | | | |
| **INSPECTION TESTING AND CONTROL** | | | ● | ● | | | | | ● | ● | | ● | | | | ● | | | ● | ● | | | | | | | | | |

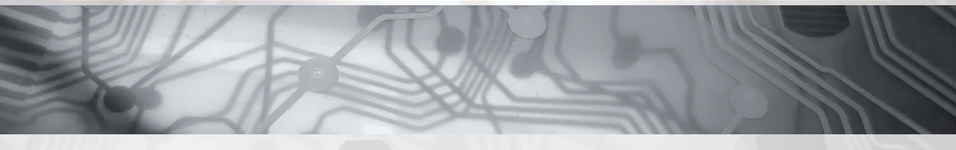


# ASTRONOMY



| | ABENGOA | AERNNOVA AEROSPACE | AIMEN TECHNOLOGY CENTRE | AIRBUS DEFENCE AND SPACE | ALE HEAVYLIFT IBERICA | ALTER TECHNOLOGY TÜV NORD | ANALISIS Y SIMULACIÓN | APPLUS+ LABORATORIES | ASTURFEITO | AVS | AWGE TECHNOLOGIES | BETESA - BRÚJULA TELECOM | CADINOX | CELIA - CELESTIA INGENIERIA DE SISTEMAS | CEN SOLUTIONS | CESA | CITD | COMET INGENIERIA | CRISA | CRYOVAC | DAS PHOTONICS | DEIMOS SPACE | DMP | DRAGADOS | DURO FELGUERA GALDERMA PESADA | ELDO | ELYTT ENERGY | EMYS | EMPRESARIOS AGRUPADOS | ESTEYCO | FERROVIAL | FRACTAL | GMV | GTD SISTEMAS DE INFORMACIÓN | HEDISA | HILITA | IDESA | IDOM | INDRA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TRAINING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ENGINEERING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Data Processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mechanical | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Opto-mechanical Engineering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optical Engineering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical/Mechanical Engineering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Opto-electronic Engineering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Management | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Architect,Civil Engineering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Scientific Research | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| **CONSTRUCTION (BUILDING & ROAD)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Preparation (site- and earthworks) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Steel structures | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heating, cooling, Ventilation, Air conditioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compressed air | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water supply and treatment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Elec.+power supply, wind/solar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Roads | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ELECTRICAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control and communication Cables | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Switchgear and Switchboards | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Conductors and Supplies, Cables | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Measurement and Regulations | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Power Supply Components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Electrical Maintenance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ELECTRONICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Supplies - Transformers | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Circuit Boards | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| RF and Microwave Components and Equipments | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Functional Modules and Crates | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Measuring Instruments | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Passive Components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Active Components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **MECHANICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Raw Materials | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Equipment/Tools (machine tools, welding, portable/special tools...) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacture and Supply of Produce | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Standard production items General machining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Casting + molding, forging | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Welding, precision welding | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sheet metal work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Custom made pcs | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Precision Machining Work and Supply of Produce | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Custom made pcs | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Standard production items | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spark erosion machining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Specialized Manufacture | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Combined technology assemblies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Working of spec. metal/alloys | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heat treatment,surface treatmt | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibreglass, composite, plastic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ceramics moulding + machining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **INFORMATION TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hardware (comms, computers, workstations) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage Systems | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Data communication | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software (PLC, development, CAD/CAM, FEM, etc.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Consultancy (maintenance, outsourcing) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **OPTICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Opt. glass, blanks, crystals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mirrors, prisms, filters, fibres, devices, lasers, etc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optical Treatment of Material, coating | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacturing of Opto-Mechanical Devices | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laboratory Equipment - Positioning Equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optoelectronic detectors and components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Photo/Film Equipment, Materials and Consumables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **VACUUM AND LOW TEMPERATURE TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cryost.,chambers,vessels-cstmd | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pumps,pump-syst.,leak detector | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tubes,seals,fittings,stdd.comp | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control systems, measurement instrument, gauges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Refrigeration equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage+handling cryogenic liquids | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **TRANSPORTATION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hoisting gear,cranes,lifts,etc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **INSPECTION TESTING AND CONTROL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | VACUUM PROJECTS | TTI | TSK | TEKNOSERVICE | TECNOBIT | TECNATOM | TECNALIA | THALES ALENIA | TAMWESER | SOFTWARE | SEVEN SOLUTIONS | SERTEC | SENER | SEA | SCIENTIFICA | RAMEN | PROCON | PROACTIVE | OBEKI | NORTEMECANICA | NATEC | METROMECANICA | LIDAX | LEADING | JEMA | ITMA | ISOTEC | INTEGRASYS | INTARCON | INSITE | INGEMETAL | INGECIBER | INDRA | IDOM | IDESA | IBERDROLA | HULEA | HEDISA | GTD | GMV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CIVIL ENGINEERING AND BUILDINGS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Building work | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | ● | ● | | ● | | | | | | |
| Roadworks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Installation and supply of pipes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical installation work (hv=> 36kv, mv = >1kv & < 36kv, lv = < 1 kv) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Supply & installation of heating and air-conditioning equipment | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | ● | |
| Hoisting gear | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water supply and treatment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Miscellaneous: compressed air,fire detection,fuel oils,lubricating oils,building materials,fireproofing materials,scaffolding,heat and sound insulation, false floors,storage equipment | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Maintenance - cleaning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road transports | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ELECTRICAL ENGINEERING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Switchgear and distribution boards (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv if not different indication) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power transformers for ac distribution | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power cables, busbars and accessories (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control and communication cables | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| Emergency power supplies and ups | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reactive power compensators and harmonic filters (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv if not different indication) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ac/dc & ac/ac power converters (rated continuous power from 100kva to 1mva) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ac/dc & ac/ac power converters (rated continuous output power above 1 mva) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Superconducting magnets (winding packs) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| Standard industrial measurements, control, and regulation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| Miscellaneous (transformers, ac motors, industrial fittings,lighting equipment, insulation material, maintenance) / electrical engineering (hv => 36kv, mv => 1kv & < 36kv, lv =< 1 kv if not different indication) | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | |
| Components for electrical engineering (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ELECTRONICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Active components / electronics | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | ● | | | | ● | |
| Passive components / electronics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring instruments for electronics | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power supplies - transformers / electronics | | | ● | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | ● | | | | | | |
| Functional modules and crates | | | | | ● | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rf and microwave components and equipment | | ● | | | | | ● | | | | ● | | | | | | | | | | | | | | | | ● | | | | | | ● | | | | | ● | |
| Circuit boards | | | | | ● | | | | | | ● | | | | | | | | | | | | | | | | | | | ● | | | | ● | | | | | |
| Miscellaneous( racks, casings, boxes, chassis, fans, servo-motors, tachos, synchros, batteries, heat exchangers) | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | ● | | | | ● | |
| Assembly and wiring work / electronics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | |
| **DATA PROCESSING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Computers and workstations | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | ● |
| Storage media | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Peripherals | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Interfaces | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | ● |
| Software | | | | | | | | | ● | ● | | | | | | ● | | | | | | | | | ● | | | | | | | ● | | ● | | | ● | ● |
| Consumables for data processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Storage furniture (data processing) | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Data communication | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | ● |
| **MECHANICAL ENGINEERING SUPPLIES AND MANUFACTURING TECHNIQUES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Supply of raw materials | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | |
| Machine tools, workshop and quality control equipment | | | | | | ● | | ● | | | | | | | | ● | | | | | | ● | | | | | | | | | ● | | | ● | ● | ● | | | |
| Casting and moulding / manufacturing techniques | | | | | | | | | | | | ● | | ● | | | | | | | | | | ● | | | | | | | | | | ● | | | | | | |
| Forging & plates/ manufacturing techniques | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | ● | | |
| Boiler metal work / manufacturing techniques | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | ● | | | |
| Sheet metal work / manufacturing techniques | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | ● | | | |
| General machining work / manufacturing techniques | | | | | | | | | | | | | | | | ● | | ● | | | | ● | | | | | | | | | ● | | | ● | ● | ● | | | |
| Precision machining work / manufacturing techniques | | | | | | ● | | | | | | | | | | ● | | ● | | ● | | ● | | ● | | | | | | | ● | | | ● | ● | ● | | | |
| Specialized manufacturing techniques | | | | | | ● | | | | | | | ● | | | ● | | | | | | ● | | ● | | | | | | | ● | | | ● | | ● | | | |
| **VACUUM AND LOW-TEMPERATURE TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vacuum pumps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Refrigeration equipment / vacuum & low-temperature techno. | ● | ● | | | | | | | | | | | ● | | | | | | | | | | | | | | | | ● | | | | | | | | | | |
| Gas-handling equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage and transport of cryogens | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| Measurement equipment / vacuum and low-temperature | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Low-temperature materials | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Vacuum components and chambers | ● | ● | | | | | | | | | | | ● | | | | | ● | | | | ● | | | | | | | | | | | | ● | | | | | |
| Low-temperature components | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | ● | |
| Miscellaneous: lubricants,climatic test chambers, ovens, evaporators | ● | ● | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| **SPECIAL TRITIUM SYSTEMS AND COMPONENTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Small bore tubing and fittings for gas service | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valves for gas services | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Instrumentation | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Gas pumps and compressors for gas service | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Glove box components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water detritiation system components | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Special materials for tritium processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atmosphere detritiation system components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **REMOTE HANDLING SYSTEMS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remote handling transporters and robotic devices | | | | | | | ● | | | | | ● | ● | | | ● | ● | | | | | | | | | | | | | | | | | ● | | | | | ● |
| Manipulators | | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | ● |
| Remote handling tooling | | | | | | ● | | | | | ● | | ● | | | | | | | | | ● | | | | | | | | | | | | ● | | | | | ● |
| Viewing & metrology systems | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | ● | | | | | | | | | | | ● |
| Specialised knowledge | | | | | | | | | | | ● | | | | | | | | | | | ● | | | | | | | | | | | | ● | | | | ● | ● |
| **DIAGNOSTICS & DETECTORS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Detectors | | | | | | | | | | | | | ● | | ● | | | | | | | | | | | | | | | | | | | | ● | | | | | ● |
| Other optical, rf and spectroscopic equipment | | | | | | | | | | | ● | | ● | | ● | | | | | | | | | | | | | | | | | | ● | ● | | | | | ● |
| **ENGINEERING SUPPORT SERVICES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Civil and plant engineering - services and consultancy | | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | | | | | ● | | | | | |
| Mechanical engineering - components services and consultancy | | | | | | ● | | | | | | ● | ● | | | | | ● | | ● | | | | | ● | | | | | | | | ● | | ● | | | | |
| Mechanical engineering - systems and plants - services and consultancy | | | | | | | | | | | | ● | ● | | | | | | | | | | | ● | | | | | | | | | ● | ● | ● | | | | |
| Remote handling and assembly - services and consultancy | | | | | | | | | | | | ● | ● | | | | | | | | | ● | | | | | | | | | | | | ● | | ● | | | ● | ● |
| Electrical engineering - services and consultancy | | | | | | | | | | | | | ● | | | | | | ● | | | | | | | | | | | | | | | ● | ● | | | | | |
| Nuclear and safety engineering - services and consultancy | | | | | ● | | | | | ● | | ● | ● | ● | | | | | | | | | | | | | | | | | | | | ● | ● | | | | ● | ● |
| Electronics and informatics - services and consultancy | | ● | | | | | | | | ● | ● | | ● | | | | ● | | | | | | | | | | | | | | | | ● | | | | | ● | ● |



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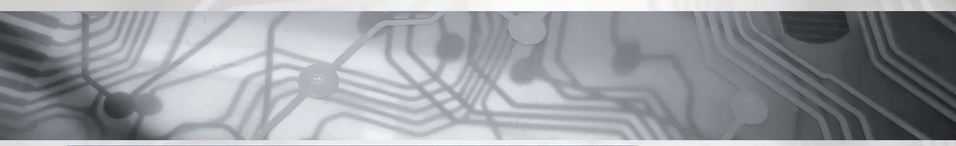
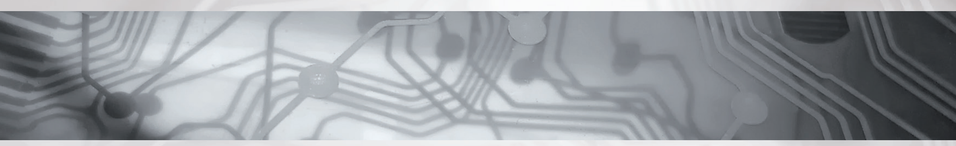


| | FUS_ALIANZ | FRACTAL S.L.N.E. | FERROVIAL | ESTEYCO | ENSA | EMBEDDED | ELYTT | ELDU | EIT | EE-AA | DURO FELGUERA | DRAGADOS SA | DMP | DEIMOS SPACE | DAS PHOTONICS | CT INGENIEROS | CINVOMAC | CINSA | COMET INGENIERIA | CITD | CESA | CELIS | CEIN SOLUTIONS | CEIT | CADINOX | BITESA - BROAS TELECOM | AWSE TECHNOLOGIES | AVS | ASTURFEITO | ARMALEA | APPLUS+LABORATORIES | ANTEC | ANALISIS Y SIMULACION | ALTER TECHNOLOGY | ALE HOHOLTLIFT IBERICA | AIRBUS | AMREN TECHNOLOGY | ABENGOA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CIVIL ENGINEERING AND BUILDINGS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Building work | | | • | | | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Roadworks | | | • | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Installation and supply of pipes | | | • | | | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical installation work (hv=> 36kv, mv = >1kv & < 36kv, lv = < 1 kv) | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Supply & installation of heating and air-conditioning equipment | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hoisting gear | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water supply and treatment | | | • | | | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Miscellaneous: compressed air,fire detection,fuel oils,lubricating oils,building materials,fireproofing materials,scaffolding,heat and sound insulation, false floors,storage equipment | | | • | | | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maintenance - cleaning | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road transports | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | |
| **ELECTRICAL ENGINEERING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Switchgear and distribution boards (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv if not different indication) | | | • | | | | | | | • | | | | | | • | | | | | | • | | | | | | | | | | | | | | | |
| Power transformers for ac distribution | | | • | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | • | | | | • |
| Power cables, busbars and accessories (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv) | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Control and communication cables | | | • | | | | | | | • | | | | | | • | | | | | | | | | | | | | | | | | | | | | |
| Emergency power supplies and ups | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Reactive power compensators and harmonic filters (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv if not different indication) | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ac/dc & ac/ac power converters (rated continuous power from 100kva to 1mva) | | | | | | | | | | • | | | | | | | | | | | | • | | | | | | | | | | | | | | | • |
| Ac/dc & ac/ac power converters (rated continuous output power above 1 mva) | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Superconducting magnets (winding packs) | | | | | | | • | | | • | | | | | | | | | | | | | | | | | | | | | | • | | | | | |
| Standard industrial measurements, control, and regulation | | | • | | | | | | • | • | | | | | | | | | | | | | | | | | | | | | | | • | | | | • |
| Miscellaneous (transformers, ac motors, industrial fittings,lighting equipment, insulation material, maintenance) / electrical engineering (hv => 36kv, mv => 1kv & < 36kv, lv =< 1 kv if not different indication) | | | • | | | | | • | | • | | | | | | • | | | | | | | | | | | | | | | | | | • | | | |
| Components for electrical engineering (hv = > 36kv, mv = > 1kv & < 36kv, lv = < 1 kv) | | | • | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| **ELECTRONICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Active components / electronics | | | • | | | • | | | | • | | | | | | | | | | | | | | | | | • | | | | | | | | | | |
| Passive components / electronics | | | • | | | • | | | | • | | | | | | | | | | | | | • | | | | | | | | | | | | | | |
| Measuring instruments for electronics | | | • | | | | | | | • | | | | | | | | | | | | | • | | | | | | | | | | | • | | | • |
| Power supplies - transformers / electronics | | | • | | | | • | | | • | | | | | | | • | | | | | | | | • | | | | | | | | | | | | • |
| Functional modules and crates | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Rf and microwave components and equipment | | | • | | | | | | | • | | | • | | | | | | | | | • | | • | • | | | | | | | | • | | | | |
| Circuit boards | | | • | | | | | | • | • | | | • | | | | | | | | | • | | | | • | | | | | | | | | | | • |
| Miscellaneous( racks, casings, boxes, chassis, fans, servo-motors, tachos, synchros, batteries, heat exchangers) | | | • | | | | | | | • | | | • | | | | | | | | | | | | | • | | | | | | | | | | |
| Assembly and wiring work / electronics | | | • | | | | | | • | • | | | | | | | | | | | | • | | | | • | | | | | | | • | | | | • |
| **DATA PROCESSING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Computers and workstations | | | • | | | | | | | • | | | • | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage media | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Peripherals | | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Interfaces | | | • | | | | | | | • | | | • | | | | | | | | | | | | | | | | | | | | • | | | | |
| Software | | | • | | | | | | | • | | | • | | | | • | | | | | • | | | | | | | | | | | | | | | |
| Consumables for data processing | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage furniture (data processing) | | | • | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | |
| Data communication | | | • | | | | | | | • | | | • | | | | | | | | | | | | | | | | | | | | • | | | | |
| **MECHANICAL ENGINEERING SUPPLIES AND MANUFACTURING TECHNIQUES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Supply of raw materials | • | | • | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | | | | • | | |
| Machine tools, workshop and quality control equipment | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | • | | |
| Casting and moulding / manufacturing techniques | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | |
| Forging & plates/ manufacturing techniques | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boiler metal work / manufacturing techniques | | | | | | | | | | | • | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| Sheet metal work / manufacturing techniques | | | | | | | | | | | | | | | | • | | | | | | | | • | | • | | • | | | | | | | | | |
| General machining work / manufacturing techniques | | | | | | | | | | | | | | | | • | | | | | | | | | | • | • | • | | | | | | | | | |
| Precision machining work / manufacturing techniques | | | | | • | | | | | | | | • | | | • | | | | | | | | | | • | | • | | | | | | • | • | • | |
| Specialized manufacturing techniques | | | | | • | | | | | | | | • | | | • | | | | | | | • | | | • | • | • | | | | | | • | • | • | |
| **VACUUM AND LOW-TEMPERATURE TECHNOLOGY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vacuum pumps | | | | | | | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | |
| Refrigeration equipment / vacuum & low-temperature techno. | | | | | | | | | | | | | | | | • | | | | • | | | | | | | • | | | | | | | | | | |
| Gas-handling equipment | | | • | | | | | | | | | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| Storage and transport of cryogens | | | | | | | | | | | | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| Measurement equipment / vacuum and low-temperature | | | | | | | | | | | | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| Low-temperature materials | | | | | | | | | | | | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| Vacuum components and chambers | | | | | • | | | | | | • | | | | | • | | | | | | | | • | | | • | • | | | | | | | | | |
| Low-temperature components | | | | | | | | | | | • | | | | | • | | | | | | | | | | | | • | | • | | | | • | | | |
| Miscellaneous: lubricants,climatic test chambers, ovens, evaporators | | | | | | | | | | | | | | | | • | | | | | | | | | | | • | | | | | | | | | | |
| **SPECIAL TRITIUM SYSTEMS AND COMPONENTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Small bore tubing and fittings for gas service | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valves for gas services | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Instrumentation | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gas pumps and compressors for gas service | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Glove box components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water detritiation system components | | | | | • | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Special materials for tritium processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atmosphere detritiation system components | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **REMOTE HANDLING SYSTEMS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remote handling transporters and robotic devices | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manipulators | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remote handling tooling | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | • | | | | | | | |
| Viewing & metrology systems | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Specialised knowledge | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | • | | | | |
| **DIAGNOSTICS & DETECTORS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Detectors | • | | | | | | | | • | | | | | | | | | | | | | | | | | • | • | | | | | | | | | | |
| Other optical, rf and spectroscopic equipment | • | | | | | | | | | | | | | • | | | | | | | | | | | | | • | | | | | | | | | | |
| **ENGINEERING SUPPORT SERVICES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Civil and plant engineering - services and consultancy | | | • | • | | | | | | • | | | | | | • | | | | | | • | | | | | | | | | | • | | | | • |
| Mechanical engineering - components services and consultancy | | | • | • | | • | | | | • | | • | | | | • | | • | • | | | • | | | | • | • | | | • | • | • | | | | • |
| Mechanical engineering - systems and plants - services and consultancy | | | • | • | | • | | | | • | | | | | | • | | | • | | | | | | | • | | | | • | • | | | | | |
| Remote handling and assembly - services and consultancy | | | • | • | • | | | | | • | | | | | | • | | | | | | | | | | • | | | | | • | | | | | |
| Electrical engineering - services and consultancy | | | • | | | • | | | | • | | | | | | • | | | | | | | | | | | | | | | • | | | | | • |
| Nuclear and safety engineering - services and consultancy | • | | • | | | | | | | • | | | | | | | | | | | | | | | | | | | • | • | • | | | | | |
| Electronics and informatics - services and consultancy | • | | • | | | | | | | • | | | | | | • | • | | | | | • | | | | | | | | | • | | | | | |

| | CIVIL ENGINEERING | Site Adaptation Works for Particle Accelerators | Design and construction of buildings for accelerator facilities | Clean rooms | HVAC systems(heating, ventilation, air conditioning) | Fire detection and safety | Electrical systems for buildings | MECHANIC AND MECHATRONIC | High precision mechanics and mecatronics | High precision alignment and metrology | Design and manufacturing of large mobile structures | Design/manufacturing support structures; girders, insertion devices supports,etc. RF power systems design | ELECTRICAL SYSTEMS | Design/manufacture of power convertors for accelerators | Design/manufacture of high stability power supplies for magnets | Pulsed power technology | Manufacturing of superconducting cabling | ELECTROMAGNETISM AND SUPERCONDUCTIVITY | Design/manufacturing of warm magnets | Design/manufacturing of superconducting magnets | Design/manufacturing of permanent magnets | RADIOFRECUENCY SYSTEMS | Design/manufacturing of RF warm cavities | Design/manufacturing of RF superconducting cavities | Design/manufacturing of RF accelerator structures | Design/manufacturing of waveguides | Design/manufacture of RFpreamplifiers and amplifiers | Design/manufacture of RF modulators | High voltage power supplies for RF structures | Integration RF power systems | CRYOGENIS AND VACUUM | Design/manufacturing of vacuum vessels | Design/manufacturing of ultra high vacuum systems cavities | Design/manufacturing of cryomodules | Cryogenic plants and systems | TARGETS, DETECTIONS, INSTRUMENTATION AND SOURCES | Particules targets for experiments | Optomechanic instrumentation | Semiconductor and gaseous-type detectors | Scintillation-type detectors | Beam diagnostics systems | Low-noise electronics | Design/manufacturing of proton/ion sources | Lasers | SOFTWARE AND CONTROL | Advanced data storing and processing | Design of simulation tools | Accelerators/storage ring control systems | Timing and synchronization systems | Machine protection systems | Personal safety systems | Remote handling for radioactive environments | RADIOACTIVITY PROTECTION | Radioprotection materials | Radiation monitoring and safety | SPECIALIZED MANUFACTURING PROCESSES | Welding and special union processes (EBM, brazing, bonding..) | Special materials manufacturing (Niobium, Boron Nitride, CU (ex Q2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INGECIBER | | | ● | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSYTE SA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | |
| INTARCON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INTEGRASYS SA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JEMA ENERGY SA | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | |
| LEADING METAL MECHANIC SOLUTIONS | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIDAX | | | | | | | | | ● | ● | ● | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | |
| METROMECANICA SL | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NORTEMECÁNICA SA | | | | | | | | | | ● | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PROACTIVE R&D | | | | | | | | | ● | ● | | ● | | | | | | | ● | | | | | | | | | | | | | | ● | | | | | | | | | | | | |
| PROCON SYSTEMS | | | | | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAMEN SA | | | | | | | | | ● | ● | | ● | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | |
| SCIENTIFICA INTERNATIONAL SL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | ● | ● | | | | | | |
| SENER INGENIERÍA Y SISTEMAS | | ● | ● | | ● | ● | ● | | ● | ● | ● | ● | | | | | | | | | | | | | | | | | | | | ● | | | | | ● | | ● | | | | | | |
| SERTEC SL | | | ● | | | | | | ● | ● | ● | ● | | | | | | | | | | | | | | ● | | | | | ● | | | | | | | | | | | | | | |
| SEVEN SOLUTIONS SL | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | |
| TAIM WESER S.A. | | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| THALES ALENIA SPACE ESPAÑA | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | ● | ● | | | | | | | | | | | | | | | | | |
| FUNDACIÓN TECNALIA RESEARCH & INNOVATION | | | | | | | | | | | | | | ● | | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | | ● | |
| TECNOBIT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEKNOSERVICE SL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ● | | | | | | | | | | |
| TTI NORTE SL | | | | | | | | | | | | | | | | | | | | | | | | | ● | ● | ● | | | | | | ● | ● | | | | | | | | | | |
| THE VACUUM-PROJECTS | | | | ● | | | | | ● | ● | | ● | | | | | | | | | | | | | | | | | | | | ● | | | ● | ● | | | | | | | | | |

# PARTICLE PHYSICS



| | INDRA | IDOM | IDESA | HEDISA | GTD SISTEMAS DE INFORMACIÓN | GMV | FERROVIAL | ESTEYCO | ENSA | EMAYTS | ELYTT ENERGY | EDAS | DURO FELGUERA CALDERERÍA PESADA | DRAGADOS SA | DAKO | CTTD | CRYOVAC | CRISA | COMET INGENIERIA | CITD ENGINEERING & TECHNOLOGIES | CESA | CEN SOLUTIONS | CELIS - CELESTIA INGE SISTEMAS | CEIT | CADINOX | BITESA - BROAS TELECOM | AVGE TECHNOLOGIES | AVS | ASTURFEITO | ARBALEA | APPLUS+LABORATORIES | ANTEC MAGNETS | ANALISIS Y SIMULACION | ALTER TECHNOLOGY TUV NORD | AIRBUS DEFENCE AND SPACE | AIMEN TECHNOLOGY CENTRE | ABENGOA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CIVIL ENGINEERING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Adaptation Works for Particle Accelerators | | | | | | | • | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | |
| Design and construction of buildings for accelerator facilities | | | | | | | • | | | | | • | | • | | | | | | | | | | | | | | | | • | | | | | | |
| Clean rooms | | | | | | | | | | | | • | | • | | | | | | | | | | | | | | | | | | | | | | |
| HVAC systems(heating, ventilation, air conditioning) | | | | | | | • | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | |
| Fire detection and safety | | | | | | | • | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical systems for buildings | | | | | | | • | | | | | • | | | | | | | | | | • | | | | | | | | | | | | | | • |
| **MECHANIC AND MECHATRONIC** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High precision mechanics and mecatronics | | • | | • | | | | | | | | | | | • | • | | | | • | • | | • | | • | • | • | | • | | • | | | | |
| High precision alignment and metrology | | | | • | | | | | | • | | | | | • | • | | | | • | | | | | | • | • | • | • | | | | | | | |
| Design and manufacturing of large mobile structures | | | | | | | | • | • | | | | | | • | | | | • | • | | | | | • | | • | • | • | | | | | | | |
| Design/manufacturing support structures: girders, insertion devices supports,etc. RF power systems design | | | | | | | | • | • | | | • | | | • | • | | | | • | | | | | • | | | • | • | | | | | • | | |
| **ELECTRICAL SYSTEMS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design/manufacture of power convertors for accelerators | | | | | | | | | | | | • | | | | | • | | | | | | | | | • | | | | | | | | | | |
| Design/manufacture of high stability power supplies for magnets | • | | | | | | | | | | | • | | | | | • | | | | | • | | | | • | | | | | | | | | | • |
| Pulsed power technology | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • |
| Manufacturing of superconducting cabling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | | |
| **ELECTROMAGNETISM AND SUPERCONDUCTIVITY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design/manufacturing of warm magnets | | | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | • | | | | | |
| Design/manufacturing of superconducting magnets | | | | | | | | | | | | • | | | | | • | | | | | | | | | | | | | | • | | | | | |
| Design/manufacturing of permanent magnets | | | | | | | | | | | | • | | | | | | | | • | | | | | | | | | | | • | | | | | |
| **RADIOFRECUENCY SYSTEMS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design/manufacturing of RF warm cavities | | | | | | | | | | | | • | | | | | | | | | | | | | | | | | | | | • | | | | |
| Design/manufacturing of RF superconducting cavities | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | |
| Design/manufacturing of RF accelerator structures | | | | | | | | | | | | • | | | • | | • | | | | | | • | | | | | | | | | • | | | | |
| Design/manufacturing of waveguides | | | | | | | | | | | | | | | | | | | | | | | | • | | • | | | | | | | • | | | |
| Design/manufacture of RFpreamplifiers and amplifiers | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | | | | | • | | | |
| Design/manufacture of RF modulators | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | | | | | • | | | |
| High voltage power supplies for RF structures | | | | | | | | | | | | • | | | | | | | | | | | | | • | | | | | | | | • | | | |
| Integration RF power systems | | | | | | | | | | | | • | | | • | | | | | | | • | | | • | | | | | | | | • | • | | |
| **CRYOGENIS AND VACUUM** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design/manufacturing of vacuum vessels | | | | | | | | • | • | | | | • | | • | • | | • | | | | | | • | | • | • | • | | | • | | | | | |
| Design/manufacturing of ultra high vacuum systems cavities | | | | | | | | | | | | | | | • | | | | | | | | | | | | • | | | | | | | | | |
| Design/manufacturing of cryomodules | | • | • | | | | | | | | | | • | | • | | | | | | | | | • | | • | | | | | | | | | | |
| Cryogenic plants and systems | | | | | • | | | | | | | | | | | | • | | • | | | | | • | | | | | | • | | | | | | |
| **TARGETS, DETECTORS, INSTRUMENTATION AND SOURCES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Particules targets for experiments | | • | | | | | | | | | | | • | | | | | | | | | | • | | | | • | | | | | | | | | |
| Optomechanic instrumentation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Semiconductor and gaseous-type detectors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scintillation-type detectors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Beam diagnostics systems | | | | | | | | | | | | | | | | | | | | | | | | | | | • | • | | | | | | | | |
| Low-noise electronics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design/manufacturing of proton/ion sources | | | | | | | | | | | | | | | | | | | | | | | | | | | | • | | | | | | | | |
| Lasers | | | | | | | | | | | | | | | | | | | | | | | | | • | | | • | | | | | | | | • |
| **SOFTWARE AND CONTROL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advanced data storing and processing | • | | | | | • | | | | | | | | | | | | • | | | | | | | | | | | | | | | | | | |
| Design of simulation tools | | | | | | • | | | | | | • | | | | | | | | | | • | | | | | | | | | | | | | | |
| Accelerators/storage ring control systems | | | | | • | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timing and synchronization systems | | | | | | • | | | | | | | | | | | | | | | | • | | | | | | | | | | | | | | |
| Machine protection systems | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Personal safety systems | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remote handling for radioactive environments | | | | | | • | | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | |
| **RADIOACTIVITY PROTECTION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radioprotection materials | | | | | | • | | | | | | • | | | | | | | | | | | | | | • | | | • | | | | | | | |
| Radiation monitoring and safety | | | | | | | | | | | | • | | | | | | | | | | | | | | • | | | | • | | | • | | | |
| **SPECIALIZED MANUFACTURING PROCESSES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Welding and special union processes (EBM, brazing, bonding..) | | | | • | | | | | • | | | | | | • | • | | | | | | | | | | • | | | | | | • | | • | | |
| Special materials manufacturing (Niobium, Boron Nitride, CU (ex O2) | | | | | | | | | | | | | | | | | • | | | | | | | | | • | | | | | | • | | | | |

# SPANISH PUBLIC RESEARCH ENTITIES

# ASTRONOMY

**HOSTING ORGANIZATION** **INSTITUTO DE ASTROFÍSICA DE ANDALUCÍA**
**ADDRESS** **Glorieta de la Astronomía s/n 18008 Granada**
**WEB** **www.iaa.es**
**CONTACT PERSON** **Jose Manuel Vílchez**
**POSITION** **Director**
**PHONE** **+34 958 230 534**
**EMAIL** **director@iaa.es**

### Description:

The IAA is a research institute belonging to the Consejo Superior de Investigaciones Científicas (CSIC), located in Granada (Andalucía, Spain). The main activities of IAA (CSIC) are devoted to: i) carry out front-line research in the field of Astronomy and Astrophysics; ii) development of space-borne and ground-based instrumentation.

More information: http://www.iaa.es

### Main equipment:

- Mechanical & electronic workshops
- Clean room for instruments IAV (ISO8)
- Clean room for electronics AIV (ISO8)
- Optics laboratory (ISO 8)
- Cosmic Dust laboratory
- Operation of astronomical observatories:

Calar Alto Observatory (CAHA) is operated jointly by the Max-Planck-institute für Astronomie (MPIA) and the IAA (CSIC). Telescopes: 3.5m, 2.2m and 1.23m.

Sierra Nevada Observatory (OSN) is operated by the IAA (CSIC). Telescopes: 1.5m and 0.9m.

### Instruments under development:

Currently the IAA is involved in the development of the instruments:

- PHI (Solar Orbiter; ESA)
- GALA/JANUS (JUICE; ESA)
- PLATO 2.0 (ESA)
- IMaX v3 (SunRISE; NASA USA, Germany & Spain)
- SKA (SDP, INFRA-AU, INFRA-SA)
- MEGARA (GTC)
- OCTOCAM (GEMINI)
- HIRES (E-ELT)

### Technology capabilities:

- Technological development of rocket-, balloon-, and space-borne astronomical payload instrumentation for science and exploration missions (including solar and planetary exploration

missions), that cover many related fields like:

> Electronics engineering: development of power distribution units (PDU), data processing units (DPU), mechanism controller units (MCU), electrical ground support equipment (EGSE) and on board software for instrument control using FPGAs.

> Mechanical engineering: cryo-vacuum technology, high accuracy mechanics and FEA structural analysis. This know-how has been successfully applied in projects such as CARMENES (CAHA Observatory), ALMA (Band 1) and has allowed us to come in consortia such as GIADA (ESA) and HIRES (ESO).

> Optical design of astronomical instrumentation in visible and infrared ranges: telescopes, spectroscopy, imaging, photometry and polarimetry.

> Assembly, integration and verification of instrumentation.

> Software development: control software development for telescopes and astronomical instrumentation; development of pipelines for processing astronomical data and data archives; Expertise in VO (Virtual Observatory) standards and services; Big Data solutions for data processing; User-friendly tools for analysis and reproducibility

- Project management

More information: http://udit.iaa.csic.es/

**Summary of research services:**

- The IAA forms part of numerous consortia for the development of ground-based and airbrone instruments.

- The IAA provides access to multiple and advanced observing capabilities to the astronomical community, through the CAHA and OSN observatories.

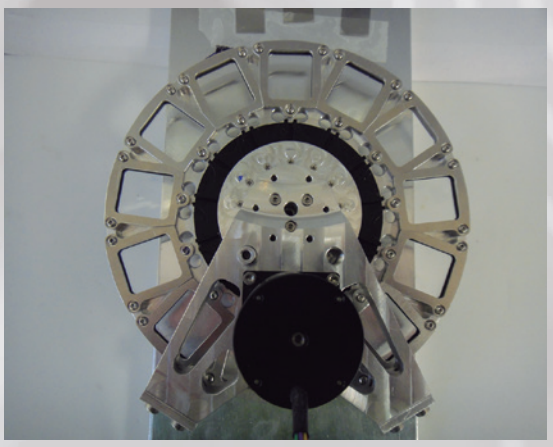
- The IAA leads the Spanish participation in the Square Kilometre Array (SKA, http://spain.skatelescope.org/) and provides (within the context of the SKA): Interaction with international consortia/groups for strategic alliances, positioning of Spanish industry, representation of Spanish groups in SKA meetings, support to membership in different SKA consortia and own participation in the SKA SDP consortium.

**Procurement process:**

In accordance with the Royal Legislative Decree 3/2011, November 14th, which approved the consolidated text of the Spanish Law of Public Sector Contracts

https://www.boe.es/boe/dias/2011/11/16/pdfs/BOE-A-2011-17887.pdf

CARMENES instrument end-to-end cryogenic development



IM Janus Filter Wheel for JUICE ESA

**HOSTING ORGANIZATION** **INSTITUTO DE ASTROFÍSICA DE CANARIAS (IAC)**
**ADDRESS** **C/Vía Láctea S/N, 38205-San Cristóbal de La Laguna, Tenerife**

**WEB** **www.iac.es**
**CONTACT PERSON** **Carlos Martínez Roger**
**POSITION** **Deputy Director**
**PHONE** **+34 922 605 201**
**EMAIL** **director@iac.es**

**Description:**

The IAC, a worldwide reference research centre in astrophysics, is a public research Consortium comprised by the Observatorios de Canarias (OOCC) and two headquarters, in La Laguna (Tenerife) and Breña Baja (La Palma). It has a state-of-the-art Technology Division with facilities and technical staff involved in the development of the most advanced instrumentation projects for the near future.

**Main equipment:**

1) Optical Laboratory: area of 160 m2, divided into three clean ISO class 8 rooms and an ISO class 6 room. Equipment includes optical instruments and a wide variety of other elements.

2) Optical fibre Laboratory: preparation, characterization and integration of optical fibres and bundles; the lab is equiped with STRASBAUGH and ENGIS polishing machines.

3) Electronics and Electromagnetic compatibility (EMC) Laboratories: design, integration and testing of electronic elements. Facilities includes shielded isolated room of 35 m3, and a variety of electronic equipment (oscilloscopes, signal analyzers, EMI receptors, etc.).

4) Laboratory of Imaging and Sensors for Astronomy (LISA): accurate calibration and characterization of visible wavelength detectors (Quantum efficiency, noise, spectral response, etc). Extension to IR detectors is already on-going.

5) Climatic chamber of 8000 liters of usable capacity, capable of simulating environments from -200C to 750C and 40% to 98% relative humidity, with 20C/minute temperature gradient. Internal dimensions are 1890x1890x2200 meters.

6) Mechanical Integration Laboratory: equipped with appropriated tools, precision measuring devices, and general purpose test cryostats and vacuum and cryogenic hardware.

7) Computer Aided Design & Engineering Laboratory: accommodates powerful hardware platforms and software to support mechanical design and analyze optical and mechanical systems.

8) Metrology Laboratory: includes a three dimensional measuring machine with precision of a few microns, and two portable coordinate measuring machines (CMM), an arm for small distances and a Laser Tracker for long distances.

9) Electronics Workshop: design of electronics systems, assembly and test. Multilayer printed circuit boards, SMDs, microcontrollers, special power supplies, racks and cables are routinely manufactured.

10) Mechanical Workshop: Traditional mechanical workshop (lathes and mills) with five numerically controlled high precision machines. Other services are a painting enclosure,

anodizing plant, shotblasting machine, furnace, several kinds of welding and cutting machines. Works on steel, stainless steel, aluminium alloys, bronce, teflon, etc.

11) Large instrument assembly, integration and verification room: With a floor area of 540 m2 and 10 m high, the lab is a 100000 class cleanroom. It is divided in several areas, including an anti-vibration plate for optics, as well as a GTC Nasmyth rotator simulator.

**Instruments under development:**

The IAC conducts instrumental projects for space facilities (PLATO, NISP, SOPHI), operation and viability of telescopes (EST, EELT, OPTICON), infrared instruments (HARMONI, HIRES, EMIR, MIRADAS, FRIDA, NIRPS), visible instruments (HORS, ESPRESSO, WEAVE, HARPS3), high-spatial resolution systems (GTCAO-LGS, AOLI, EDiFiSE, EST) or microwave instruments (TGI-QUIJOTE, FGI-QUIJOTE, SANCHO). Moreover, the IAC is fostering IACTEC, a new technological collaborative space with industry to generate high added-value technological products. It has three main lines of work: (1) In Micro-Satellites IACTEC works in the development of a sub-meter resolution camera (including optics and detector); (2) In Medical Technology to design and build a device for detection of diabetes ulcers by using thermal and microwave imaging; (3) in Large Telescopes to support the most relevant projects in which the IAC plays a major role: European Solar Telescope (EST), Cherenkov Telescope Array (CTA), and Liverpool Telescope 2 (LT2).

**Technology capabilities:**

Main capabilities are focused in Optical system design and testing, Mechanical and opto-mechanical system design and development, Cryogenic and vacuum system design and development, Precision mechanics, Adaptive optics, Fibre optics, Control systems, Sensor characterisation, Project management, Systems, Electronic system, Software design and Laser communications.

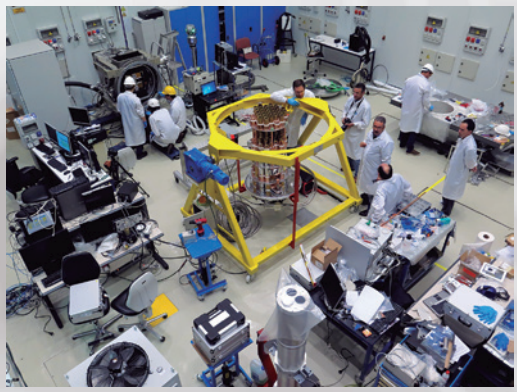
**Summary of research services:**

The IAC's Technology Division provides technology, development and production support for research and technology projects.

**Procurement process:**

Institutional Projects and Technology Transfer Office. www.iac.es/otri e-mail: otri@iac.es

Integration in the AIV room (Assembly, Integration, and Verification of large instruments) of EMIR, a wide-field camera and multi-object spectrograph in the near infrared, designed and built by the IAC for the Gran Telescopio CANARIAS (GTC) at the Roque de los Muchachos Observatory (La Palma, Canary Islands, Spain). © Pablo López /IAC.



Optical spectrograph OSIRIS, an integrated optical system for imaging and spectroscopy at low and intermediate resolution, installed on the Gran Telescopio CANARIAS (GTC) at the Roque de los Muchachos Observatory (La Palma, Canary Islands, Spain). © Pablo Bonet/IAC.


**HOSTING ORGANIZATION** CENTRO ASTRONÓMICO HISPANO-ALEMÁN (CALAR ALTO OBSERVATORY)
**ADDRESS** Sierra de los Filabres (POBox 11), ES-04550-Gérgal (Almería, Spain)
**WEB** www.caha.es
**CONTACT PERSON** Jesús Aceituno Castro
**POSITION** Director
**PHONE** +34 950 632 500
**EMAIL** director@caha.es

## Description:

Centro Astronómico Hispano Alemán (CAHA) operates an optical astronomical observatory at mount Calar Alto. At 2168 m over sea level, Calar Alto Observatory hosts six research telescopes, equipped with a wide suite of state-of-the-art instruments.

Owned by the Spanish Consejo Superior de Investigaciones Científicas (CSIC) and the German Max-Planck-Gesellschaft (MPG), Calar Alto provides data for many fields of astrophysics, for scientists from different centres and universities worldwide.

Observing time is allocated in a flexible way, in service or visitor modes, for long term and legacy projects, for granted time programs at CSIC and MPG, and for programs proposed by researchers at other institutions (open time).

Apart from the main scientific tasks, the facilities and the observatory's staff provide also some additional services for industrial, scientific and educational customers.

## Main equipment:

The telescopes that currently used under direct control of CAHA are: 3.5 m reflector; 2.2 m reflector; 1.23 m reflector; 0.80 m Schmidt camera. The 3.5 and 2.2 m telescopes are locally operated in service or visitor mode. The 1.23 and 0.8 m telescopes are normally remotely operated by the users. Main instruments:

3.5 m: CARMENES VIS+NIR hi-res spectrograph, PMAS integral field spectrograph, Omega2000 prime focus IR camera, LAICA prime focus VIS imager;

2.2 m: PANIC wide-field NIR imager, CAFÉ hi-res échelle spectrograph, AstraLux VIS lucky imager, PlanetCam VIS+NIR lucky imager, CAFOS focal reducer (direct imaging, mid-res spectroscopy and polarimetry);

1.23 m: DLR CCD direct imager; 0.8 m: comercial CCD camera.

Visiting instruments are also admitted.

Two vacuum chambers for coating mirrors up to 3.5 m diameter.

## Instruments under development:

The most recent instrumentation in use is under a continuous process of HW and SW improvement and upgrade, specially the most complex ones: CARMENES and CAFÉ spectrographs, PANIC NIR camera, PlanetCam VIS+NIR lucky imager. Other instruments under development, for sky quality monitoring: NCavex extinction monitor; Excalibur multi-band advanced robotic extinction monitor; Spica all-sky low-res spectrograph.

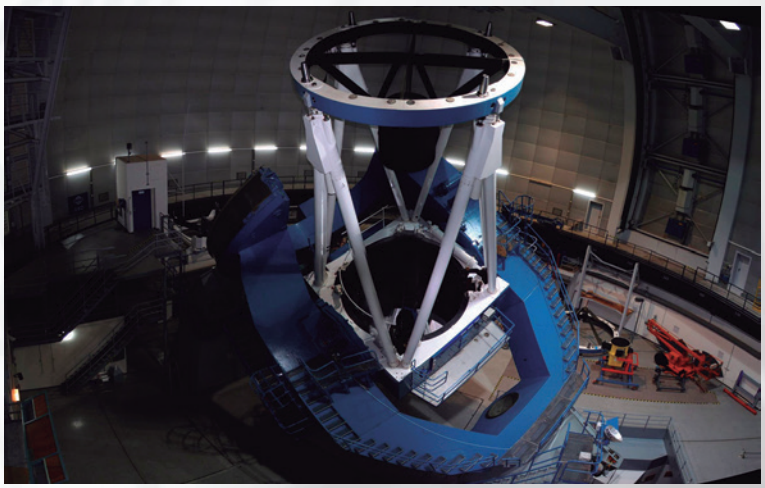
## Technology capabilities:

Control electronics. Computer network design and management. Virtual machine design and management. Massive scientific data archiving. Mechanics and electronics workshops. Operation and maintenance of industrial heavy cooling and heating facilities.Heavy hydraulic systems. High vacuum. Advanced mirror coating in vacuum chambers. Instrument design, construction and operation.

## Summary of research services:

Astronomical night-time observation in the optical: Direct imaging (VIS and NIR), high spatial resolution imaging (VIS and NIR), mid and high resolution spectroscopy (VIS and NIR), polarimetry and spectropolarimetry (VIS).

## Procurement process:

View of the greatest telescope of the Calar Alto observatory. Thanks to its 3.5m of aperture constitutes the biggest one in the mainland Europe

**HOSTING ORGANIZATION** GRAN TELESCOPIO CANARIAS (GTC)
**ADDRESS** C/Vía Láctea S/N, 38205-San Cristóbal de La Laguna, Tenerife
**WEB** www.gtc.iac.es
**CONTACT PERSON** Romano L.M. Corradi
**POSITION** Director
**PHONE** +34 922 425 720
**EMAIL** romano.corradi@gtc.iac.es

## Description:

The 10.4m Gran Telescopio CANARIAS (GTC) is currently the world's largest optical-infrared telescope. The GTC is an initiative of the Instituto de Astrofísica de Canarias (IAC), with the support of Spain Administration and the Canary Islands Autonomous Community and the international participation of institutions in Mexico (UNAM and INAOE) and in the US (University of Florida). The public company Gran Telescopio Canarias, S.A. (GRANTECAN) is responsible for its construction, operation, maintenance and development. The GTC is fully operational since 2009.

## Main equipment:

The GTC was designed to be a versatile telescope, able to simultaneously host different instruments at the seven focal stations available, whose use can be switched in few minutes. Currently three instruments are installed: OSIRIS, EMIR and CIRCE. Another one, MEGARA, will be installed in the first half of 2017. More instruments are being refurbished or are under development, see www.gtc.iac.es/instruments/instrumentation.php.

- OSIRIS (available since 2009) is an imager and spectrograph for the optical wavelength range, located in the Nasmyth-B focus of GTC. It allows standard broad-band imaging and long-slit spectroscopy, as well as narrow-band tunable filters imaging, charge-shuffling and multi-object spectroscopy. It covers the wavelength range from 0.365 to 1.05 µm with a total field of view of 7x7arcmin2 (http://www.gtc.iac.es/instruments/osiris/osiris.php).
- EMIR is a near-infrared camera and spectrograph recently installed at Nasmyth A focus. It is equipped with several state-of-the-art high-technology subsystems, such as a cryogenic robotic system of reconfigurable slits able to simultaneously obtain spectra of 50 targets. EMIR capabilities include broad-band and narrow-band imaging, and long-slit and multi-object spectroscopy over a field of view of 6.7x6.7 arcmin2. Science verification is in progress, and EMIR will be offered to the community starting on July 2017. More information at http://www.gtc.iac.es/instruments/emir/emir.php
- CIRCE is a visitor instrument made by the University of Florida operating in the 1-2.5 micron wavelength range. The total field of view is 3.4 x 3.4 arcmin2 with a plate scale of 0.1 arcsec pix-1. The instrument is available to the community since semester 2015B at focus FC-E for broad-band imaging, and will be also offered for imaging polarimetry during summer 2017. CIRCE will be decommissioned on September 2017.

## Instruments under development:

New common-user or visitor instruments are under development, and will be mounted at the GTC before the end of the decade. They are:

HORS, a high-resolution (R=25000), single source, spectrograph covering the visible range. It is under development at the IAC.

MEGARA, a MOS and IFU visible spectrograph with R up to 20,000. It is being completed at the Universidad Complutense de Madrid.

HiPERCAM, a high-speed, multi-band camera developed at the University of Durham, UK

MIRADAS, a MOS near-IR spectrograph with R=20000. It is under construction at the Univ. of Florida.

FRIDA, a near-IR imager (with the GTC adaptive optics begin developed at the IAC) and IFU spectrograph (up to R=30000), developed at UNAM, México

### Technology capabilities:

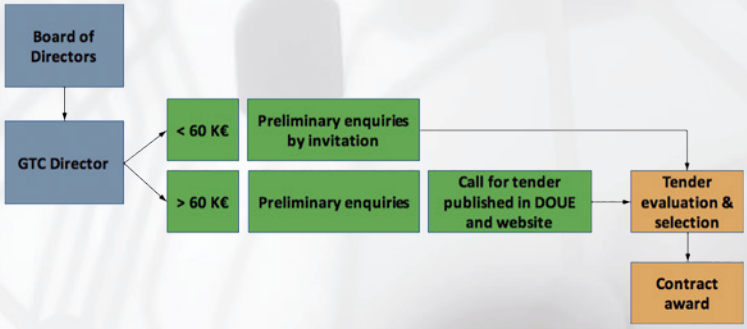
GRANTECAN has a wide expertise in the design of telescopes and their instrumentation. This includes various related technologies such as optics, mechanics, optomechanics, optoelectronics, visible and IR detectors and related systems, cryogenics, control systems and related software, etc.

### Summary of research services:

The GTC provides advanced observing capabilities to the astronomical community. While formal partners are Spain, Mexico and the University of Florida (USA), GTC is open to the interest of other user communities, both via scientific and technical collaborations and agreements.

Access to GTC observing time is done via the corresponding Time Allocation Committees. Data are obtained in service-queue mode, or in visiting mode. More information at http://www.gtc.iac. es/observing/observing.php

### Procurement process:




Inside the GRANTECAN telescope

| | |
|---|---|
| **OBSERVATORY** | **OBSERVATORIO DEL ROQUE DE LOS MUCHACHOS (ORM) AND OBSERVATORIO DEL TEIDE (OT).** |
| **HOSTING ORGANIZATION** | **INSTITUTO DE ASTROFÍSICA DE CANARIAS (IAC)** |
| **ADDRESS** | **Observatorio del Roque de los Muchachos: Pico del Roque de los Muchachos, Garafía (La Palma, Spain)**<br>**Observatorio del Teide: Izaña (Tenerife, Spain)** |
| **WEB** | **www.iac.es** |
| **CONTACT PERSON** | **Rafael Rebolo**<br>**POSITION Deputy Director**<br>**PHONE +34 922 605 201 / +34 922 605 200**<br>**EMAIL director@iac.es** |

### Description:

The "Observatorios de Canarias" (OOCC) are formed by the "Observatorio del Roque de Los Muchachos" (ORM, La Palma) and the "Observatorio del Teide" (OT,Tenerife), both at above 2,400 meters of altitude. The excellent astronomical quality of the sky at the Canary Islands – thoroughly characterized and protected by law – makes these observatories astronomical reserves, open to the international scientific community since 1979. Currently the OOCC host telescopes and instruments belonging to 60 institutions from 20 countries, being the most important set of astrophysical infrastructures within the territory of the European Union (EU) for visible and infrared nocturnal and solar research, and the largest collection of multinational telescopes worldwide. Other experiments for high-energy astrophysics and the study of the cosmic microwave background complete the infrastructures available.

### Main equipment:

• ORM offers one of the most complete telescope arrays around the world. There are a number of night-time observation telescopes: GTC, WHT, TNG, NOT, INT, LT, Mercator, SQFT and JKT. It also has two solar telescopes: SST and DOT, and other infrastructures like the Cherenkov telescopes MAGIC I and II and FACT, SuperWASP, two DIMMA, SHABAR, CILBO and the ESFRI Research Infrastructure CTA-North.

• OT is ideally suited for studying the sun, concentrating the best European solar telescopes: GREGOR, THEMIS, and VTT. In addition, it also has a number of night-time observation telescopes: TCS, Stella I and II, OGS, SONG, IAC80, MONS, SLOOH I and II, BRT, EarthShine, TADn,TIZON, XO, MASTER, LCOGT CILBO, EAST and TIZON. Most of them are remote or robotically operated. The OT also has a Solar Physics Laboratory with some instruments: two telescopes –QUIJOTE I and II- to study the Cosmic Microwave Background Radiation and several experiments to check the sky quality: DIMMA, SHABAR, SQM-LE, AstMon.

### Instruments under development:

The IAC conducts projects on the operation and viability of telescopes (E-ELT, EST, FDI, OGS,OPTICON), instruments on space facilities (Herschel, Planck, IMaX, JEMEUSO IRCAM, NISP@EUCLID, SOPHI), infrared (EMIR, MIRADAS, FRIDA, HARMONI, CARMENES, HIRES), and visible (HORUS, ESPRESSO, GREGOR, WEAVE, DESI) instrumentation, adaptive optics (GTCAO and LGS, EDiFiSE, FastCam, AOLI) or microwave (QUIJOTE).

More information: www.iac.es

### Technology capabilities:

The IAC develops much of the technology used for its research programmes in-house. The Technology Division is responsible for designing, developing and building the instruments needed for astrophysical observation. The IAC Instrumentation Area provides technology, development and production support for research and technological development projects. This area has staff who are highly qualified in the disciplines of mechanics, optics, electronics and software and have access to advanced development and production techniques. The Division is organized into Engineering and Production and structured as a matrix, with project managers coordinating the resources.

Requests from individuals or public or private entities outside the IAC which relate to require human or material resources administered by the IAC Instrumentation Area are managed by the OTRI office.

More information: www.iac.es

### Summary of research services:

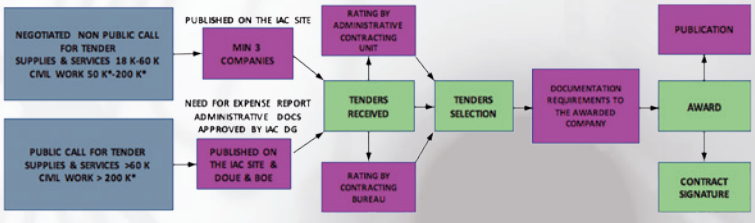
Under the terms of the Agreement on Cooperation in Astrophysics, Spain provides the site in return for a percentage of the available observing time at each of the telescopes or instruments. Observing time is awarded through the Time Allocation Commission (CAT), comprising a Solar Committee and a Night Time Committee.

There are different schemes to apply for observing time: ordinary calls (twice a year); Spain-Mexico GTC collaborative time; IAC-Nordic collaborative time; Director Discretionary Time; International Time Programme. Every semester, a number of nights of CAT time are available to service observations of short scientific programmes. The Sevice Time observations are carried out by the IAC's Support Astronomers Group and the presence of the user astronomer in the telescope is not required. The service time is available for six telescopes: WHT,INT,NOT and TNG at ORM, under CAT time, andTCS and IAC80 Telescopes at the OT, under non-CAT time.

Pure research activities at the IAC are organized into six subject areas covering most fields within Astrophysics whether theoretical, observational or instrumental. The IAC conducts projects on earth and space telescopes, high resolution, infrared instrumentation, optics and microwaves, as well as technological support.

More information: www.iac.es

### Procurement process:




BOE stands for Bulletin of the State; DOUE stands for Official Journal of the European Union; IAC stands for Instituto Astrofísico de Canarias

Panoramic view of Roque de los Muchachos Observatory

**HOSTING ORGANIZATION** INSTITUT DE RADIO ASTRONOMIE MILLIMÉTRIQUE (IRAM)
**ADDRESS** Pico Veleta, Sierra Nevada (Granada, Spain)
**WEB** www.iram-institute.org
**CONTACT PERSON** Rafael Bachiller
**POSITION** Director Observatorio Astronómico Nacional (IGN)
**PHONE** +34 912 653 403
**EMAIL** r.bachiller@oan.es

## Description:

The Institut de Radioastronomie Millimétrique (IRAM) was founded in 1979 and is operated as a French-German-Spanish collaboration. Its partner institutions are the Centre National de la Recherche Scientifique (CNRS) in France, the Max Planck Gesellschaft (MPG) in Germany and the Instituto Geográfico Nacional (IGN) in Spain. The IGN participates with a fraction of investment and operation expenses and, in return, IGN gets a fraction of the observing time on each IRAM telescopes and a participation in Administrative and Technical Committees. The observatories are supported by the IRAM offices and laboratories in Granada and Grenoble.

IRAM operates two observatories, the NOEMA Interferometer at the Plateau de Bure (France) and the observatory at Pico Veleta located in Sierra Nevada (Granada, Spain), 2850 m high.

Partnership with national and international space research organisations includes ESA, NASA and CNES. IRAM also is a major partner in the international ALMA project, the giant radio observatory in the Chilean desert.

## Main equipment:

The observatory at Pico Veleta houses a single dish radio telescope of 30 m in diameter. It allows taking radio continuous and bolometric measurements, microwave spectrometry and Very Long Baseline Interferometry (VLBI). The 30-meter telescope is equipped with a series of single pixel receivers operating at 3, 2, 1 and 0.8 millimeters and with two cameras working at 1 millimeter: HERA, with 9 pixels, for the mapping of molecular gas in extended nebulae and bolometric cameras dedicated to the observation of dust emission from nearby molecular clouds and also out to the farthest known galaxies and black holes.

## Instruments under development:

IRAM has coordinated the design and construction of a new bolometric camera (called NIKA-II) which is being installed at the 30-m telescope to be offered as a general purpose instrument to the IRAM community.

Heterodyne cameras for multipixel spectroscopy are also under development.

## Technology capabilities:

Design of parabolae and their control systems, design and production of ultra-sensitive super conducting detectors and complex receiver systems, high-speed digital electronics and advanced data reduction software.

Groups and laboratories at IRAM: Frontend team; SIS-Lab; Backend team; Mechanical workshop group; Computer group. The IRAM workshop is equipped with the latest generation of CNC lathes and milling machines and non-contact measuring microscopes.

### Summary of research services:

The observing time must be obtained by international competition. Proposals for observations with the IRAM telescopes may be submitted twice per year through the Proposal Management System PMS. The submission period starts about three weeks before a deadline. Submission deadlines are currently around mid-March and mid-September each year for the summer (01 June-30 November) and winter (01 December-31 May) scheduling periods.

A fraction of the observing time that normally belongs to scientists of the IRAM funding countries (France, Germany and Spain) is allocated to other European astronomers provided that their observing projects have been judged “excellent”. In return, IRAM obtains from the European Commission financial support to cover parts of the instrument operating costs. The IRAM telescopes are also open to scientists from non-European countries, such as Americans and Japanese, as long as they submit top science proposals.

### Procurement process:

Main contracts are awarded by IRAM-Grenoble. Moreover, the local contracts related to the operation of the IRAM 30-m radiotelescope (both for goods and services) are awarded by IRAM-Granada. In both cases, IRAM performs as a private company subjected to the French or the Spanish law, respectively.

IRAM 30-meter radio telescope at Pico Veleta (Sierra Nevada, Spain)

| | |
|---|---|
| **OBSERVATORY NAME** | **OBSERVATORIO DE SIERRA NEVADA** |
| **WEB** | **www.osn.iaa.es** |
| **HOSTING ORGANIZATION** | **Instituto de Astrofísica de Andalucía - CSIC** |
| **ADDRESS** | **Glorieta de la Astronomía s/n 18008 Granada** |
| **CONTACT PERSON** | **Susana Martín Ruiz** |
| | **POSITION Director** |
| | **PHONE +34 958 121 311** |
| | **EMAIL susana@iaa.es** |

**Description:**

The Observatorio de Sierra Nevada (OSN) is a high mountain observatory located at 2896 meters of altitude within the Sierra Nevada National Park (Granada, Spain). The observatory is operated and supplied by the Instituto de Astrofísica de Andalucía (IAA-CSIC). Its southernmost high altitude location in continental Europe together with the dry climatic conditions of Sierra Nevada makes the observatory a excelent place for carrying out other experiments and studies. For this, in addition to the main building, there are secondary facilities which complete the infrastructure available.

**Main equipment:**

Two optical telescopes, both with a Ritchey-Chrétien configuration and two Nasmyth foci, with two instruments attached in each telescopes:

- 1.5m telescope (T150): CCD Camera (CCDT150) and Albireo spectrograph

- 0.90m telescope (T90): CCD Camera (CCDT90) and six-channel Strömgren photometer

**Instruments under development:**

- Albireo, a low- and intermediate-resolution spectrograph attached to the T150 at the end of the 90s, has been refurbished. The new characteristics of Albireo will allow us to use the instrument as a Gaia RVS duplicator with a R~12000.The instrument is in commissioning process and it will be operative by the second semester of 2017.

-New CCD camera for the T150 telescope. It will be installed during the summer of 2017.

**Technology capabilities:**

The technical support and maintenance of the OSN is performed by the IAA Instrumental and Technological Development Unit (UDIT, Unidad de Desarrollo Instrumental y Tecnológico). This unit participates in projects for development of astronomical instrumentation for both ground-based telescopes and space missions. The observatory receives support in different areas:

- Electronics: The control of the telescopes, domes and instruments were developed by the UDIT staff; therefore, the support is continuous and necessary. Design and development of analogic and digital circuits, power electronic, PCBs, among others.

-Mechanics: Development in mechanical structures as well as maintenance of mechanical components for the OSN. Optomechanics, high precision for positional systems and thermal analysis of mechanical components.

- Optics: Optical design of instruments and components. Maintenance and cleaning of mirrors of the telescopes. Measurements of transmittance, absorbance and reflectance of the optical filters.

- Software: Development of pipelines for processing astronomical data, data archives and control

of instruments by software.

**Summary of research services:**

- The observatory provides observation using the instruments attached in both telescopes. The Time Allocation Committee (TAC) evaluates the proposals for observing time at OSN.

- There are three observing modes: service, remote and in-situ (visitor) modes. The observations are carrying out by the night assistant in 'service' mode while in 'remote' mode, the observations are made remoting by the astronomer with the help of the OSN staff

- ToO (Target of Oportunity) observations. Observers have to submit a general application for observing time as for standard observations.

- Director's Discretionary Time (DDT). A small fraction of time and those nights without observations will be allocated to OSN director.

- Basic maintenance of those instruments and experiments hosted at OSN in collaboration with other institutions.

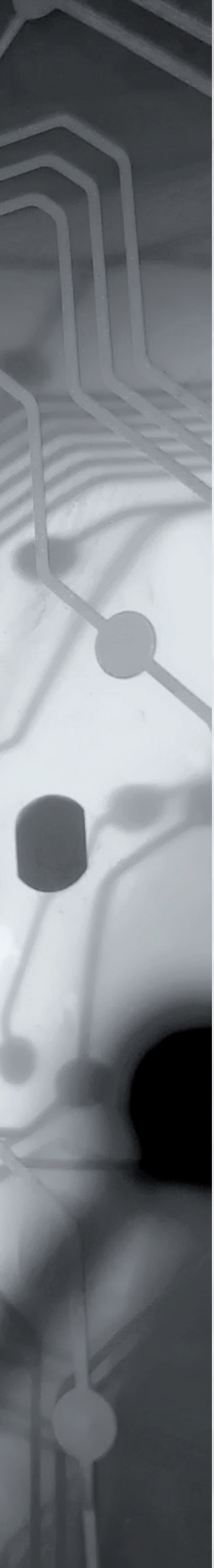
- Observations for master students.

**Procurement process:**

The OSN belongs to Instituto de Astrofísica of Andalucía (IAA– CSIC), therefore, the procurement process is the same. In accordance with the Royal Legislative Decree 3/2011, November 14th, which approved the consolidated text of the Spanish Law of Public Sector Contracts

https://www.boe.es/boe/dias/2011/11/16/pdfs/BOE-A-2011-17887.pdf

Aerial view of the Observatorio de Sierra Nevada.



# FUSION

**HOSTING ORGANIZATION** CIEMAT-LABORATORIO NACIONAL DE FUSIÓN (LNF)
**ADDRESS** Av. Complutense 40, 28040 Madrid
**WEB** www.ciemat.es
**CONTACT PERSON** Ramón Gavela González
**POSITION** Director General
**PHONE** +34 913 466 411
**EMAIL** ramon.gavela@ciemat.es

## Description:

LNF is the Spanish partner of the Eurofusion consortium, who manages the European Integrated Fusion programme. In addition to its own research in this field, LNF coordinates the work of around fifteen "linked third parties" , universities, R&D centres and industries withon Eurofusion.

In addition, LNF participates in experiments and developments for the international projects JET, W7X, JT60, ITER,DEMO and IFMIF (IFMIF-EVEDA and IFMIF-DONES)

## Main equipment:

The group is presentely formed by around 130 people (basically physicists, enginners and technicians ). LNF operates the TJ-II stellarator facility and a number of Fusion Technology facilities. Alltogether the facilities form the "LNF" ICTS (singular scientific-technical facility), included in the Spanish ICTS programme.

## Projects under development:

JET (UK, owned by the European Union). Participation in experiments, developoment of fast camera systems, development of disruption prediction algorithms

W7X (Germany). Participation in experiments, development of pellet injector and microwave reflectometer

JT60 (Japan). Design and procurement of the cryostat

ITER (France, International partnership). Work on: control& data acquisition, visible/infrared viewing system, microwave reflectonetry system, neutronics, tritium transport calculations

DEMO ( pre design phase). Materials (structural & fucntional) irradiation experiments and modelling, liquid metals (lithium, lithium/lead), breeding blankets (dual coolant), remote handling, neutronics, nuclear safety , stellarator reactor configurations, socioeconomic studies (with CIEMAT Energy Department)

IFMIF-EVEDA (Japan). Accelerator components: RF system, beam diagnostics, high energy beam transmission, medium energy beam transmission, beam dump. IFMIF integrated design, medim flux irradiation cell.

IFMIF-DONES (design phase). Project leadership, project control, integrated design, accelerator components, safety. Site studies (host proposal).

## Technology capabilities:

Mechanical engineering. Finite elements calculations, CAD-CATIA design, vacuum systems, leak detection, cooling systems

Fabrication & assembly. Own workshop, limited size components

Electrical engineering. Power electronics, signal electronics, high power RF systems.

Nuclear calculations. Neutronics

Sensors: X-ray, UV, Visible, Infrared, Millimeter wave radiometry, Microwave. Fast particles.

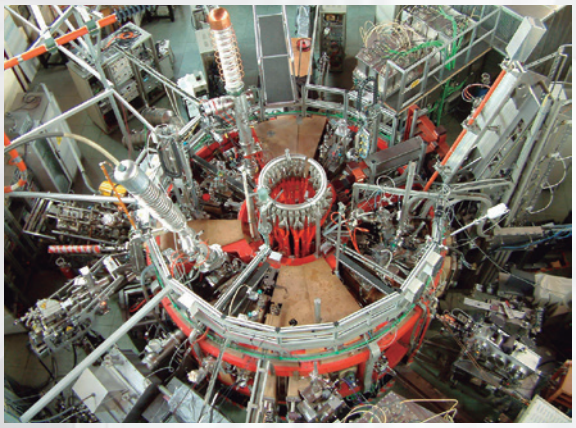
Materials characterization: SIMS, FUB milling, nanonindenter, ductility test, optical & electrical properties.

Liquid metals: lithium, lithium/lead

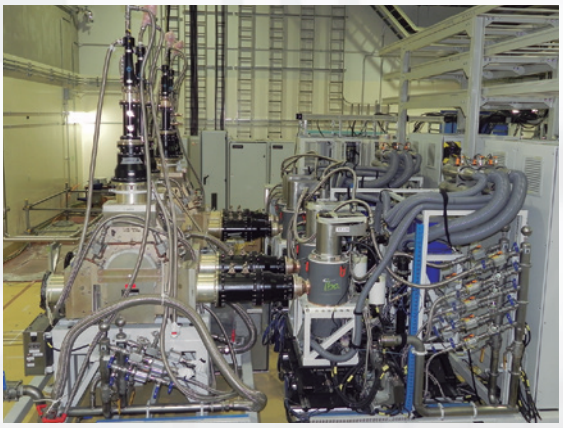
Data. Data management, data mining

**Summary of research services:**

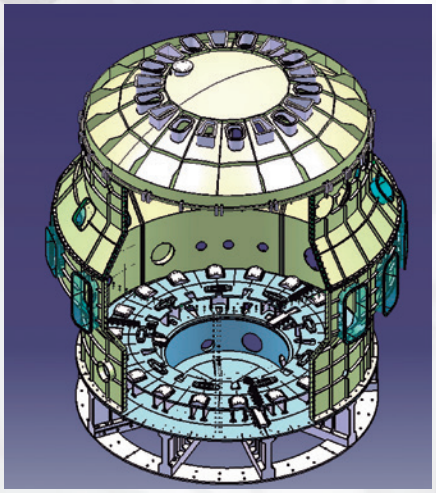
Services related to the above technologies



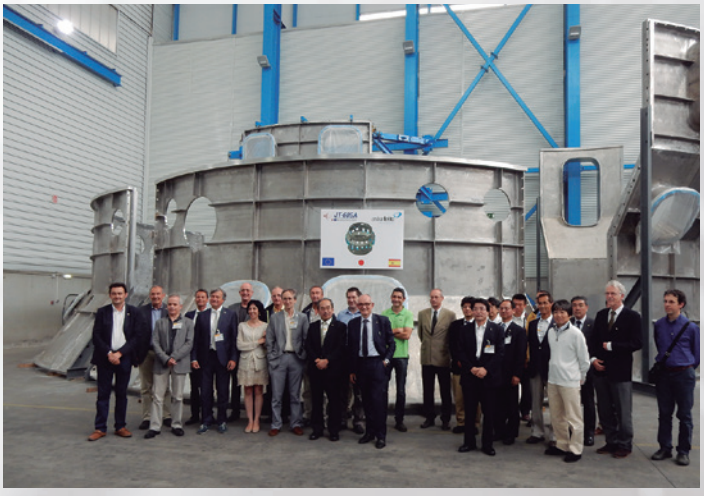
TJ-II experiment



IFMIF RF System, shipped to Rokkasho, Japan



JT60 Cryostat design



Cryostat body, under fabrication at Asturfeito, Asturias

# PARTICLE PHYSICS

**HOSTING ORGANIZATION** ALBA SYNCHROTRON
**ADDRESS** Carrer de la Llum 2-26, 80290, Cerdanyola del Valles, Barcelona, Spain
**WEB** www.albasynchrotron.es
**CONTACT PERSON** Alejandro Sánchez
**POSITION** Industrial Liaison Officer
**PHONE** +34 935 924 419
**EMAIL** asanchez@cells.es

## Description:

ALBA Synchrotron is a Research Infrastructure based on a 3 GeV 3rd generation synchrotron facility, supporting national and international scientific communities, both academic and industrial. Presently has eight operating beamlines, three more in construction and capability for another set of ten. Available techniques are dedicated to matter characterization in life science and material science. It is owned 50% by the Spanish MINECO and 50% by GenCat.

## Main equipment:

Structural characterization of materials: X-ray powder diffraction, both with high resolution and high pressure; X-ray magnetic dichroism; X-ray scattering and reflectivity; X-ray photoemission microscopy.Structural characterization of bio samples: macromolecular crystallography; X-ray scattering at small and wide angle; X-ray cryomicroscopy and tomography, Infrared spectroscopy

Chemical characterization of bio and material samples: X-ray absorption spectroscopy; X-ray fluorescence; IR spectromicroscopy; X-ray photoemission microscopy, including Near Ambient Pressure Photoemission.

Others: magnetic measurement laboratory; radiofrequency laboratory; vacuum laboratory; optics and metrology laboratory; electronic laboratory.

## Projects under development:

Angle resolved photoemission spectroscopy; protein crystallography for micro crystals, instrumentation and detector dedicated beamline with powder diffraction and absorption spectroscopy.

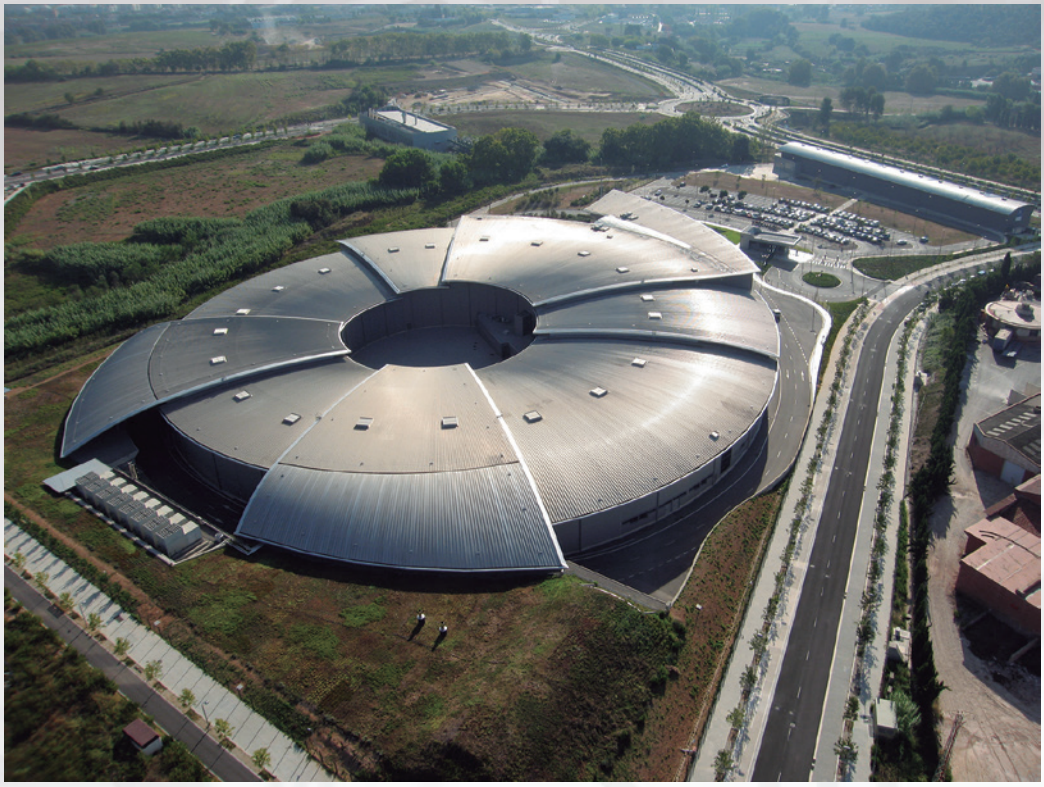
## Technology capabilities:

Accelerator technology (magnet, radiofrequency, vacuum, diagnostics, services, controls), IT capabilities, optics and metrology, mechanical engineering including high precision design and realization, civil infrastructures for high-tech research facilities, technology transfer.

## Summary of research services:

Academic and industrial access to all scientific instruments and laboratories, technology transfer, innovation, scientific outreach to society.

## Procurement process:



Aerial view of the ALBA Synchrotron

Optical hutch of the XALOC beamline, devoted to macromolecular crystallography


Interior of the accelerator tunnel. Booster, on the left, where electrons reach 3 GeV energy. Storage ring, on the right, where electrons, guided by magnetic fields, emit energy in the form of synchrotron light.

**HOSTING ORGANIZATION** CIEMAT-DEPARTAMENTO DE TECNOLOGÍA
**ADDRESS** Av. Complutense 40, 28040 Madrid
**WEB** www.ciemat.es
**CONTACT PERSON** Ramón Gavela González
**POSITION** Director General
**PHONE** +34 913 466 411
**EMAIL** ramon.gavela@ciemat.es

## Description:

The Accelerator Technology Unit is ascribed to the Electrical Engineering Division in the Department of Technology. It is a group devoted to the development of advanced components for particle accelerators, including the integration of complete compact accelerators.

Especially relevant is the participation in Large Facilities based on Accelerators, like those located at CERN or DESY.

## Main equipment:

The group is presentely formed by around 30 people (basically enginners, physicists and technicians ) performing design, calculation, fabrication and testing of accelerator components or complete accelerators. It also includes two halls for fabrication, assembly and commissioning, one of them with a clean room for metrology activities.

An additional facility is a superconducting laboratory for testing small accelerator superconducting magnets and devices at cryogenic temperatures.

Finally it is ongoing an installation for hosting a superconducting compact cyclotron for radioisotope production which includes a facility for testing some components of small accelerators, specially ion sources.

## Projects under development:

DESY

- E-XFEL : Development and delivery of superconducting combined magnets, positioning tables (movers) and control racks.

CERN

- HL-LHC: Development of a superconducting nested dipole and participation in the QUACO project for delivering 2 quadrupole magnets

- CLIC: Development of Power Extraction Transfer Structure (PETS), Accelerating Structures and a Gradient Dipole based on permanent magnets.

- FCC (EuroCirCol): Participation in the design of the 16T Nb3Sn superconducting magnets and design of the Cryogenic Beam Vacuum System.

FUSION

- IFMIF: Design and fabrication follow-up of resistive magnets, superconducting solenoids, scrappers and buncher cavities. Integration of the Medium Energy Beam Transport Line.

INTERNAL

- AMIT: Design, Fabrication and Commissioning of a Compact Superconducting Cyclotron for radioisotope production.

**Technology capabilities:**

CALCULATION & DESIGN: Proven expertise in electromagnetic, mechanical and thermal calculation and design of accelerator components including radiofrequency, resistive and special magnets and especially superconducting magnets.

FABRICATION & ASSEMBLY: Mechanical workshop at CIEMAT and two asembly halls. Long experience in the external fabrication follow-up of prototypes and series of components.

TESTING: Also a long tradition for testing superconducting magnets, RF components and, in general, for performing electrical and mechanical tests.

**Summary of research services:**

Technologies related to Accelerators including:

Superconductivity: Development of Superconducting Magnets

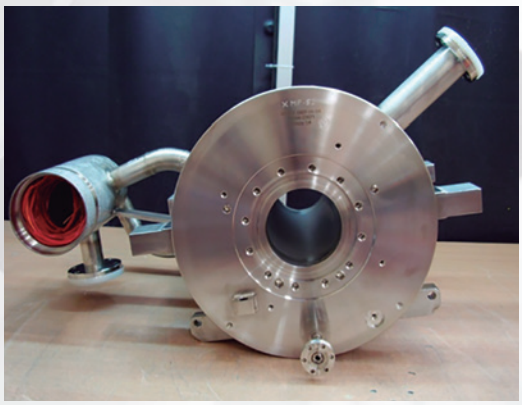
Radiofrequency: Development of resistive RF cavities

Electromagnetism: Development of resistive magnets and special magnets like kickers or septa

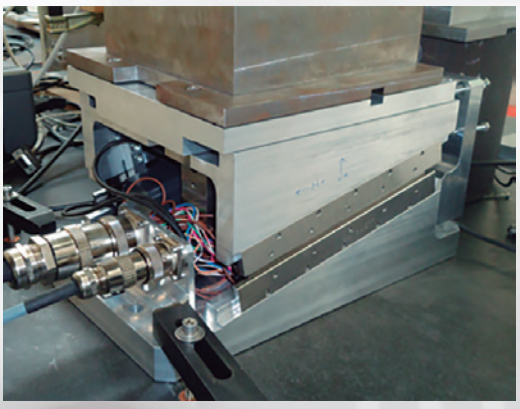
Mechanichs: Development of static & dynamic structures for accelerator components

Instrumentation: Development of different systems for beam instrumentation

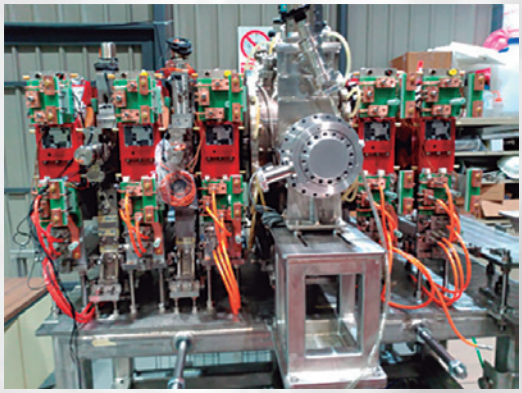
Beam dynamics: Beam Simulation and definition of specifications for accelerator components



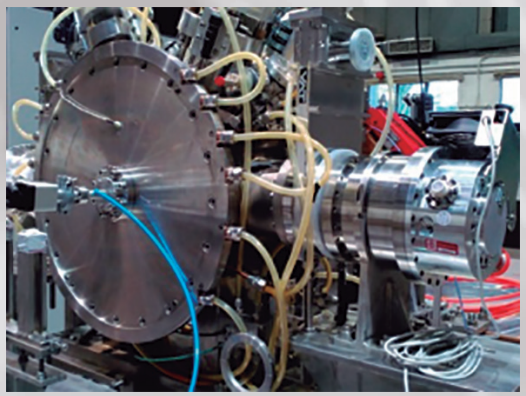
Superconducting magnet for E-XFEL



Mover for E-XFEL



Delivery & Assembly of the MEBT for LIPAC (IFMIF)



Design & Fabrication of the Bunchers for LIPAC (IFMIF)

**HOSTING ORGANIZATION** ESS BILBAO
**ADDRESS** Polígono Ugaldeguren III, polígono a, 7b, 48170 Zamudio
Spain
**WEB** www.essbilbao.org
**CONTACT PERSON** José Luis Martínez Peña
**POSITION** Director Ejecutivo
**PHONE** +34 946 076 620
**EMAIL** essbilbao@essbilbao.org

### Description:

ESS Bilbao is a Consortium in which two public administrations each hold a 50%, Spanish Government and Basque Government. ESS Bilbao is an international strategic center for neutron technologies which generates knowledge and added value through the Spanish In-Kind contribution to the European Spallation Source, a large-scale neutron research infrastructure currently being built in Lund, Sweden.

### Main equipment:

ESS Bilbao test benches are in our facility in Zamudio (Vizcaya) where the scientists are running up with the commitments works for the European project.

-ISHP (Ion Source-Hidrogen Positive): ECR-type ion source and LEBT (injector), producing a pulsed proton beam at 45 KeV, 40 mA, up to 2.84 msec, 50 Hz.

-RF test Stand: High power RF test stand, providing up to 3 MW peak at 352 MHz, for testing and conditioning of RF components such as power couplers, cavities, etc.

-AWF (Advanced Welding Facility): Electron-beam welding, vacuum brazing furnace, clean room, metallography, metrology, CNC workshop, for specialized welding processes of different metals and a broad range of dimensions.

### Projects under development:

ESS Bilbao commitment is hold a 5% stake in ESS during the construction phase through its In-Kind contribution. The work packages under contract with ESS are:

- MEBT: complete subsystem to match RFQ output and DTL input, including desing, manufacturing and testing of cavities, magnets, diagnostics, etc.
- RF systems: RF chains for the RFQ and five DTL tanks, including modulators, klystrons, waveguide distribution, low level RF controls and interlocks.
- TARGET: design, construction and testing of five targets parts (target wheel, drive unit, proton beam window, monolith vessel, proton beam instrumentation plug)
- INSTRUMENTS: working in different instruments, such as MIRACLES, in which ESS Bilbao is prime contractor.

Additionally, to upgrade the currently available injector, ESS Bilbao is developing an RFQ (Radio Frequency Quadrupole), with an extraction energy of 3 MeV.

### Technology capabilities:

The scientific and technological advances that will be generated as part of the different design,

manufacture and testing work currently underway at the test benches in our facilitites will play a key part in the Europoean project.

It comprices ion sources, cavities, electro magnets, RF, controls and diagnostics, ultra high vacuum, neutron design, mechanical design, welding,...

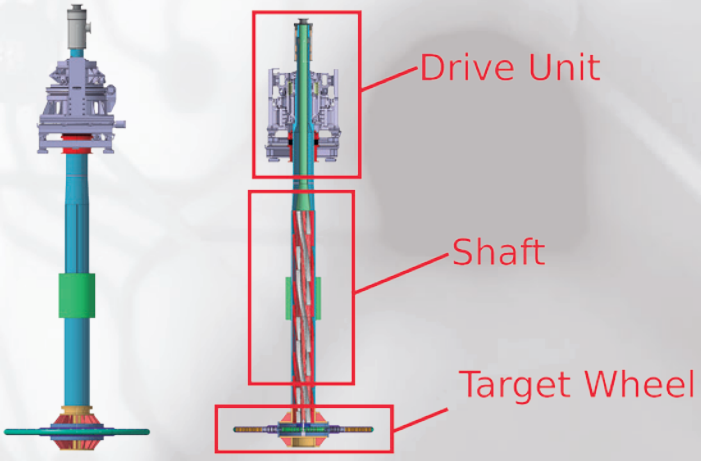
### Summary of research services:

Design, prototyping, manufacturing, testing of subsystems and components for particle accelerators, targets and neutron instruments.

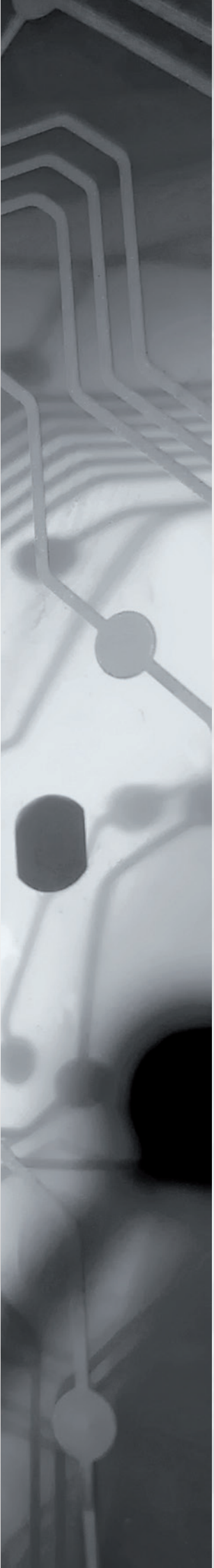
### Procurement process:

According to the Real Decreto Legislativo 3/2011 (Royal Legislative Decree), approving the consolidated text of the Law on contracts awarded by public authorities, published in the Official State Journal of Spain on 16 November 2011. The ESS Bilbao Consortium meets the condition of Public Administration. Public procurement procedures, according to European Directive, are conducted by ESS Bilbao.


Modulador Zamudio facility




Target 1



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