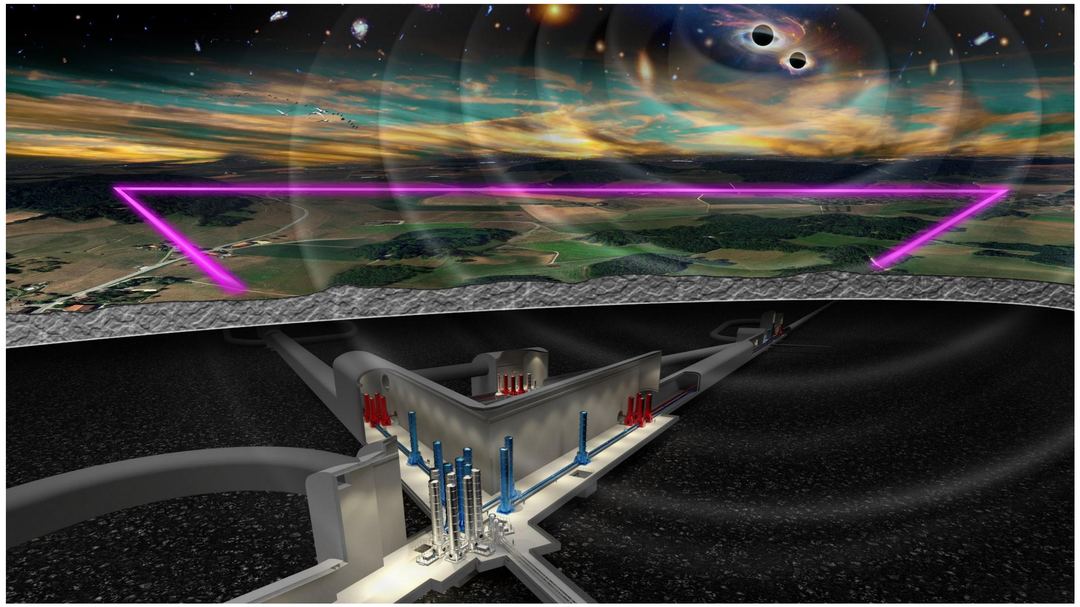
Science Infrastructures & Robotics



GTD Presentation

ET-SPAIN MEETING – 8th October 2021

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Science
Infrastructures
& Robotics

GTD is a **system and software engineering group** devoted to the design, development and integration of **large**, **complex** and/or **critical** Systems.

GTD Science, Infrastructures and Robotics is a company of the GTD Group.

Science Infrastructures & Robotics

GTD was founded in 1987, in Barcelona, with the mission to develop high quality control and information systems for the most demanding environments.

More tan 300 engineers around the world

customers in **15 countries**

+1500 hi-tech projects

Head offices:

- GTD Spain:
  Barcelona, Madrid, Cádiz
- GTD France:
  French Guiana and Toulouse
- GTD Germany
- GTD UK
- GTD Africa

Level 3 according to CMMI
Good practices in organization, development and project management.

CMMI DEV /3 SM
EXP 2018-03-04 / Appraisal #23859

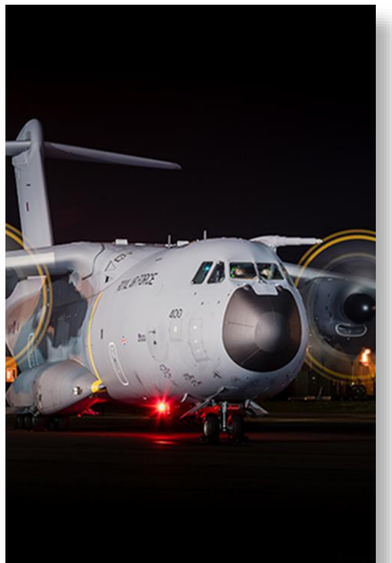
First Spanish engineering company to achieve quality certification ISO 9001

Activity Sectors – GTD Group

gtd sir
Science Infrastructures & Robotics

space

Space systems, with particular focus in commercial launchers, thus including ground-segment and onboard applications.



aeronautics

Onboard software, Validation and Verification, pilot aids: conflict detection & resolution.

big science

Command & Control and real-time distributed systems for Hi-Energy Physics and Nuclear Fusion laboratories.

infrastructures

Command & Control of intelligent, complex and large-scale energy and transport infrastructures.

robotics

Low-level, real-time, safety-critical software for robotics and remote-handling.

Science Infrastructures & Robotics

Knowledge Areas:

Hyper-Automation

Decision Support
Data Analytics
Supervision
Control Room+IaaS
Real Time Control Systems [ms]

Cobotics

Safety Critical (SIL2+Nuclear) Robotics
Remote Handling
Virtual and Augmented Reality

Edge Computing

Real Time Control Systems [µs - ns]
embedded electronics
FPGAs & RISC-V

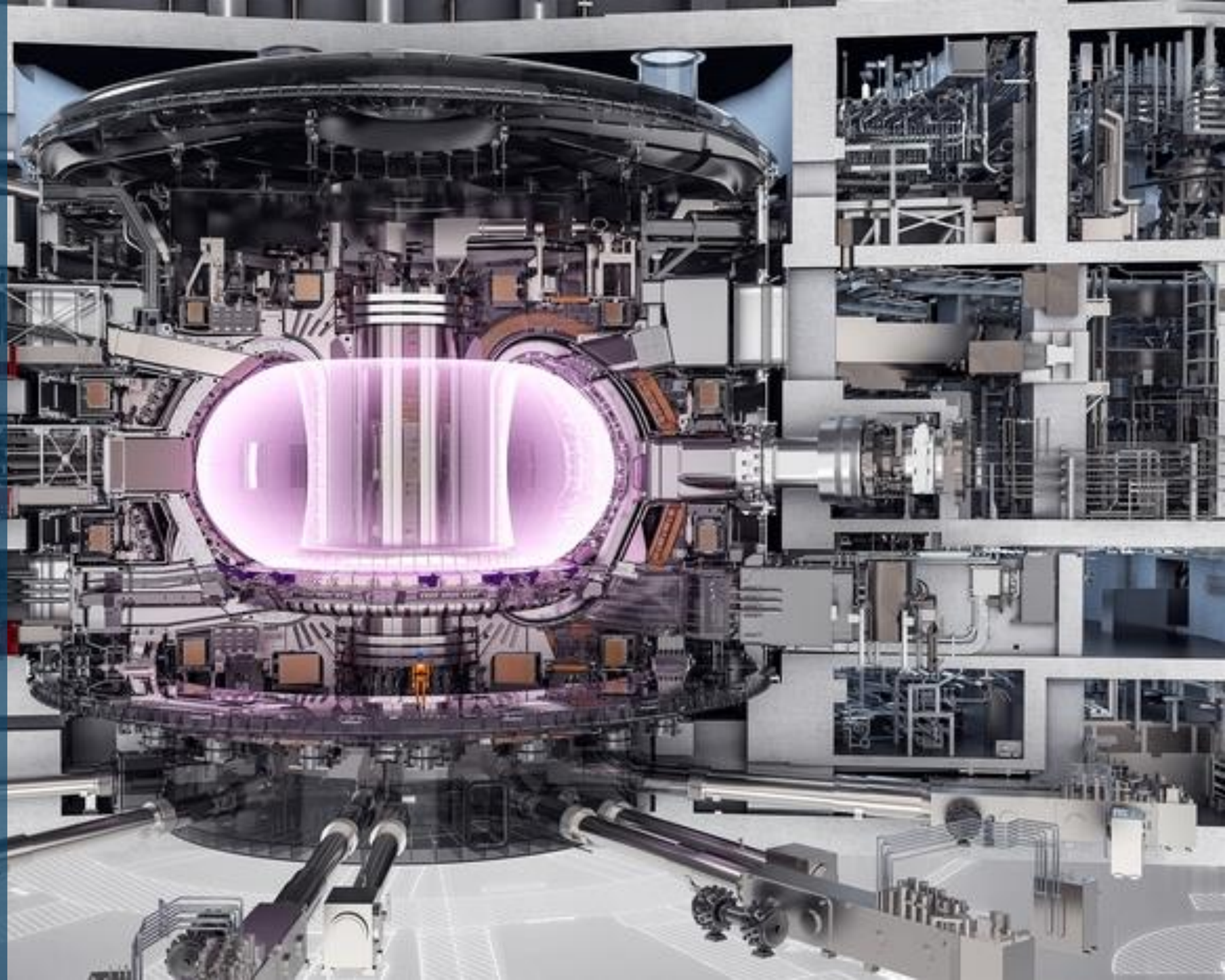
iter

FUSION FOR ENERGY

The ITER is an unprecedented international effort to demonstrate the viability of nuclear fusion to produce virtually unlimited, safe and environmental friendly energy.

The ITER works heating a plasma of hydrogen isotopes up to 150 millions of degrees, contained by means of formidable magnetic fields inside a toroidal vacuum vessel.

The ITER is currently in construction in Cadarache (France) by an international public consortium integrated by the EU, Japan, USA, South Korea, India, Russia and China. With a compromised inversion of 32.000 millions of Euros, the ITER is already the third most expensive project in the history of the humankind, yet it has the greatest potential ever to transform life conditions on earth.



Operating System for the ITER Remote Handling: GENROBOT

Fast Control (RT) + Interlock + Nuclear Safety

Instrumentation, control and integration of buildings in CODAC - the centralized control and safety system of ITER.

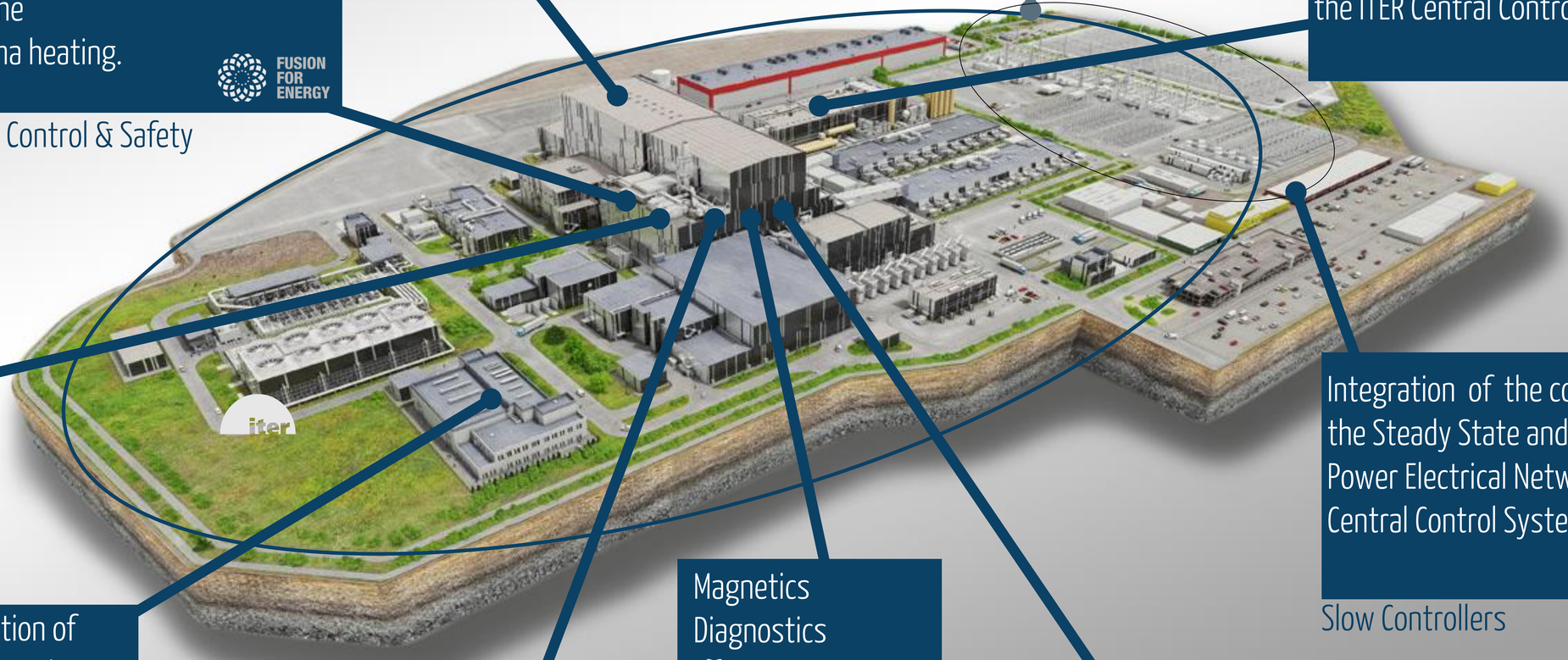
Slow Controllers: Control and Safety

Integration of the Cryogenics in the ITER Central Control System

Slow Controllers

Control & Interlock of the Gyrotrons for the plasma heating.

Fast & Slow Controllers; Control & Safety



Tokamak Simulator

Fast Controllers

Integration of the control systems of the Steady State and of the Pulsed Power Electrical Networks in ITER Central Control System.

Slow Controllers

Maintenance and evolution of the centralized control system of ITER: CODAC,

Software engineering

Vacuum control and interlock system.

Interlock + Nuclear Safety

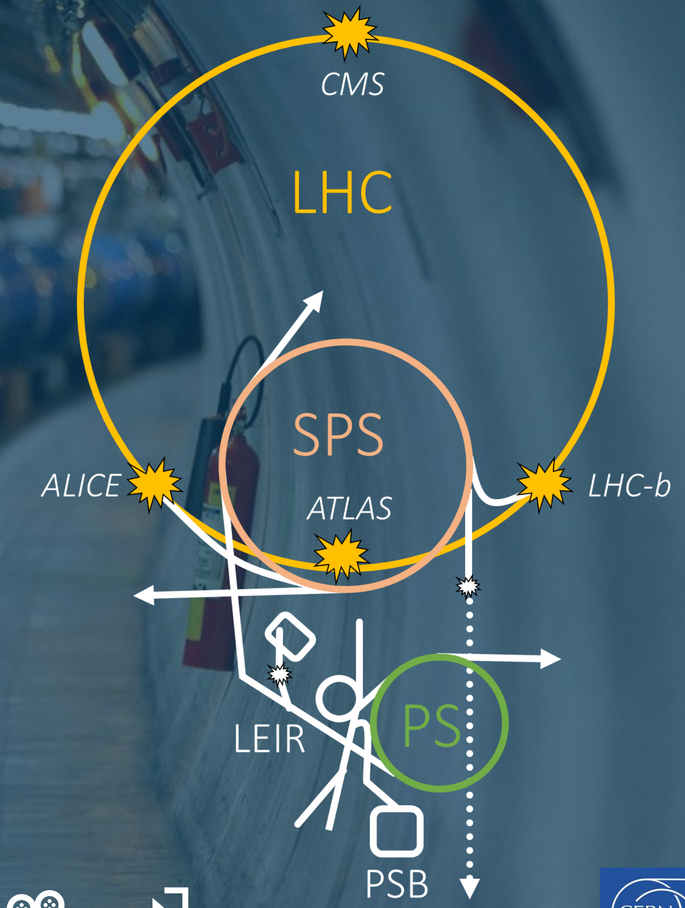
Magnetics Diagnostics

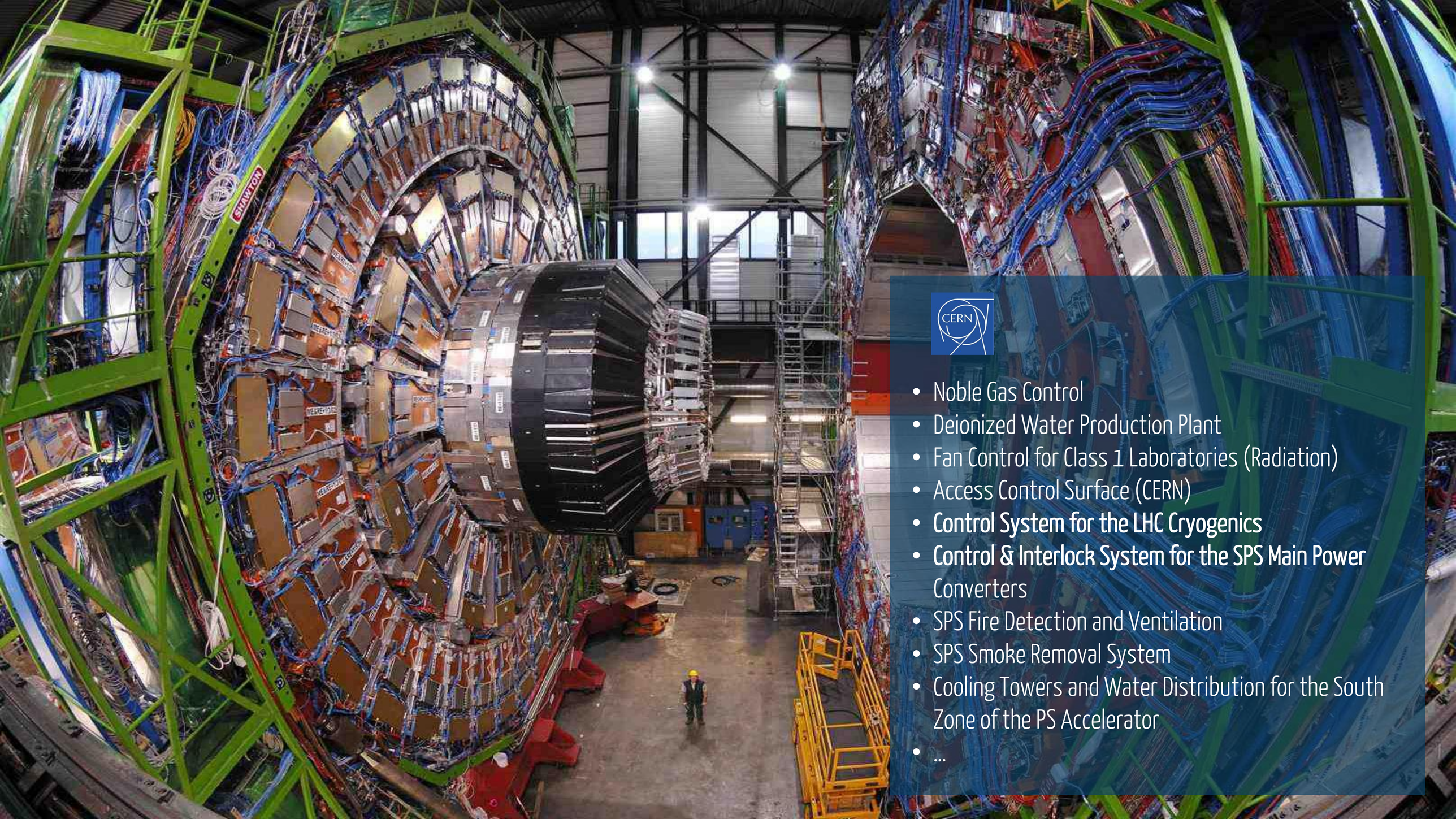
Fast Controllers

Control of the Blankets' PbLi Loops

Nuclear Safety

The CERN is the largest hi-energy physics laboratory in the world. It consists of an ensemble of six particle accelerators; among them, the LHC: again the largest and most powerful particle accelerator in the world.





- Noble Gas Control
- Deionized Water Production Plant
- Fan Control for Class 1 Laboratories (Radiation)
- Access Control Surface (CERN)
- **Control System for the LHC Cryogenics**
- **Control & Interlock System for the SPS Main Power Converters**
- SPS Fire Detection and Ventilation
- SPS Smoke Removal System
- Cooling Towers and Water Distribution for the South Zone of the PS Accelerator
- ...

- Study and Design of CERN's Control Room
- Control Room Software Support

GTD develops since 1989 the command and control systems for Ariane 5 (software, HMI, interfaces with onboard systems, ...).

GTD participates in the development of the validation tools of the European launcher (ISF), as well as in the control system of the propellant factory (UPG).

GTD has also developed the control of the umbilical arm of the cryogenic stage (EGSE) and of the emergency systems.

For the VEGA launcher, GTD has developed the extension of the control systems of the launch platform (CCS) and of VEGA's specific propellant factory. GTD has also taken over in the specification and validation of the command and control system for the launcher (LN3).

For SOYUZ, GTD has been in charge for the control of multiple safety systems, including the fluids control.

GTD has develops multiple of the shared infrastructures that are involved in the launching process in the European Space Port in the French Guyana:

- Safety tracking and tractography.
- Mission safety analysis system.
- Telemetry management system.
- Safety operations simulator.
- The centralized safety system. And the centralized alarm system.

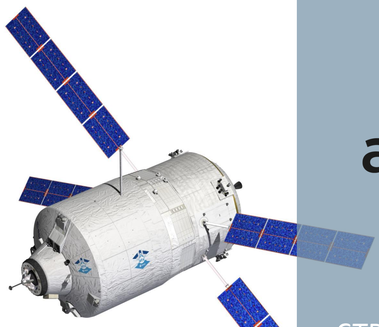
GTD has developed and maintains the main Control Room: Jupiter II – in the picture.

arianespace
arianeGROUP

esa

GTD has developed the software of the On-Board Computer (OBC) of the Ariane 5, including the construction of new specific frameworks with tools for development, unit test and automatic validation.

As for today, GTD is developing the flight control software of the new European laucher, the Ariane 6; including the misión configuration software and the complete telemetry management software.



ATV

VEGA SOYUZ ARIANE4 ARIANE 5 A5-ECA ARIANE 6

GTD develops since the last 16 years onboard software for the launchers of the European Space Agency (ESA), starting with Ariane 5, VEGA and already working in the development of next generation Ariane 6.

GTD has also developed onboard software (both for the control system and the payload) of SEOSAT, Sentinel 2, Earthcare, MTG, EDRS, BEPICOLOMBO, ... satellites and missions.

GTD implemented the automatic docking system of the ATV to the International Space Station (ISS) – which served for the first time the docking maneuver was conducted in automatic mode.

GTD also participates in the ground control systems of VEGA, SOYUZ, Ariane 4, Ariane 5 y Ariane 6.

Haliade-X is the wind turbine of 12MW developed by GE Renewable Energy. It is the largest wind turbine in the world, featuring a rotor of 220m in diameter and a total height of 260 m.

One single Haliade-X turbine generates clean energy for 16.000 households.

GTD has design and developed , based on the safest methodologies, the control layer of the Haliade-X wind turbine. In addition to safety, the control logic also maximizes the availability. GTD has developed a specific control framework for GE and is currently further extending the tools to both offshore and in-land turbines.

GTD develops an intelligent Energy Management System for ACCIONA worldwide portfolio of renewable energy (wind, solar and hydraulic). The system uses artificial intelligence to optimize in real-time the distribution and organization of the energy production, following the constraints of both the energy market and the national energy system operators.

GTD also develops the control and supervision of the hydraulic portfolio of Acciona Energy. And has implemented the hydraulic Automatic Gain Control system.

acciona

Potential contributions of GTD to ET –Synergies

- Instrumentation, Control and Systems Integration
- Control and Interlock Systems – Fast (RT) and Slow Control
- Cryogenics Control
- Simulators
- Command and Control Systems
- Control Rooms
- Monitoring and diagnostics
- Cybesecurity Analysis (Chrenkow Telescope Array)
- …

Several of our main customers and partners:

Science Infrastructures & Robotics