

Public research organization under the Spanish Ministry of Science, and Innovation through the Secretariat General for Research



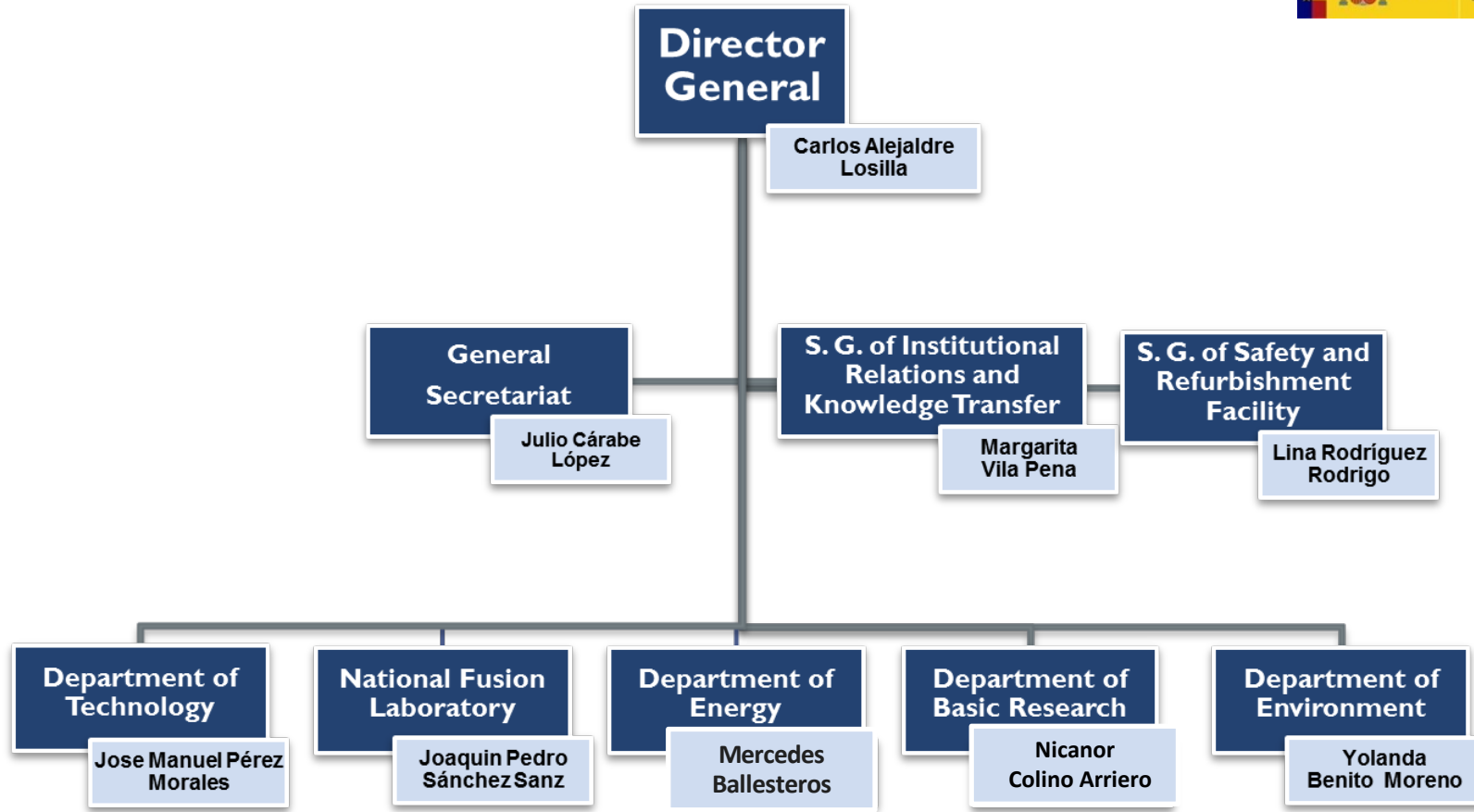
GOVERNMENT OF SPAIN

Ministry of Science and Innovation

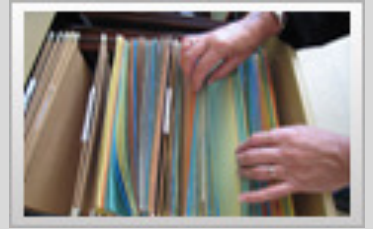
Secretariat General for Research

CIEMAT

Organization Chart



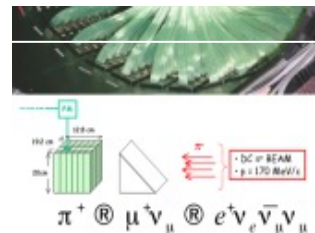
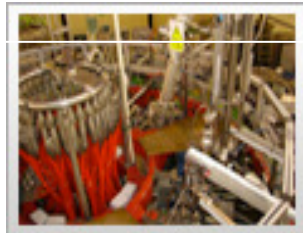
Institutional Relations



General Secretariat



Safety and Facility Refurbishment



Technology

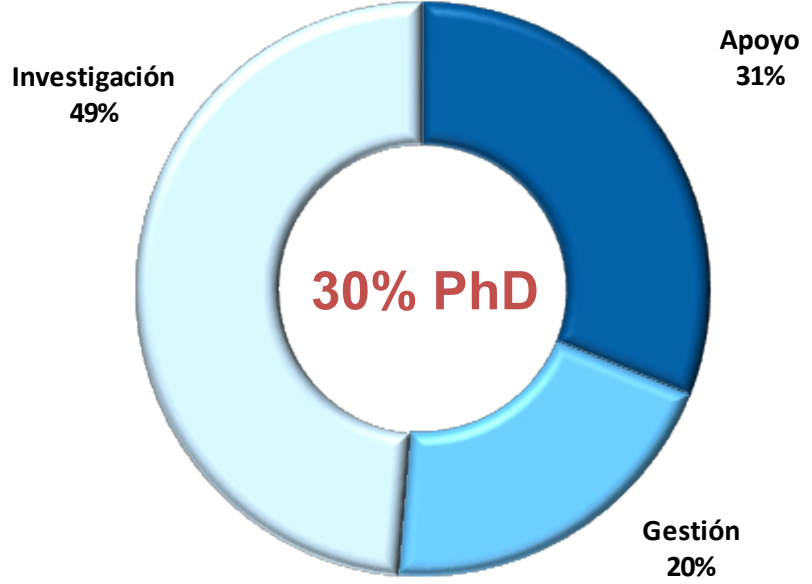
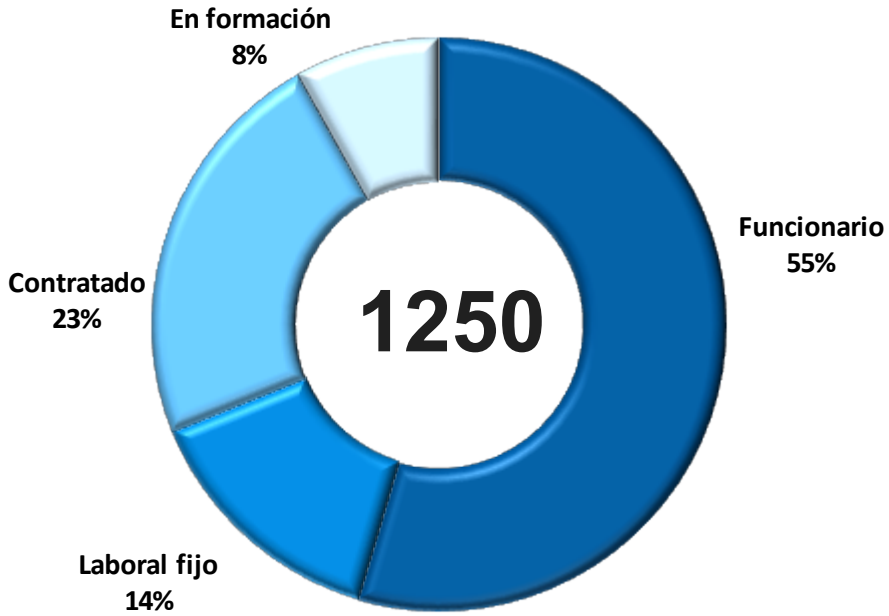
Fusion

Energy

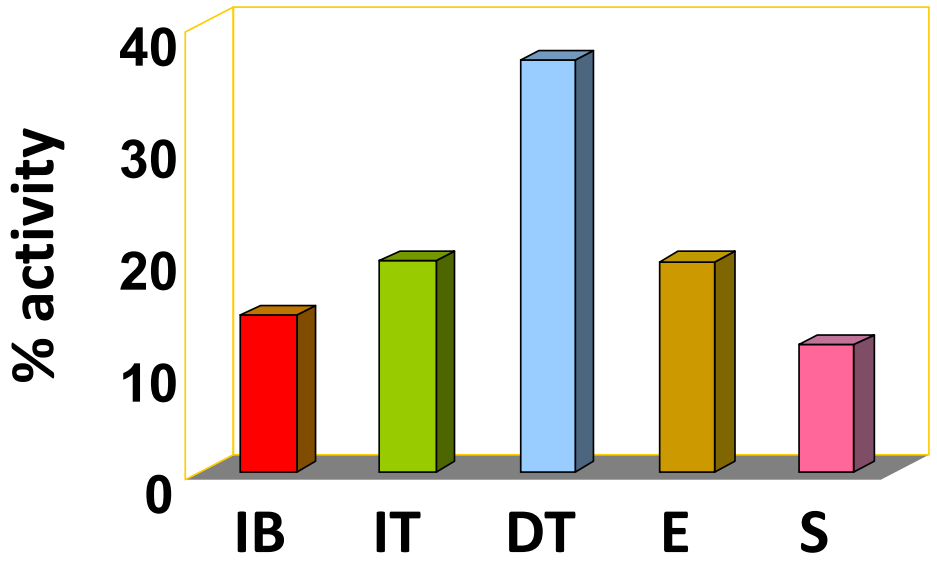
Basic Research

Environment

CIEMAT figures. Human resources

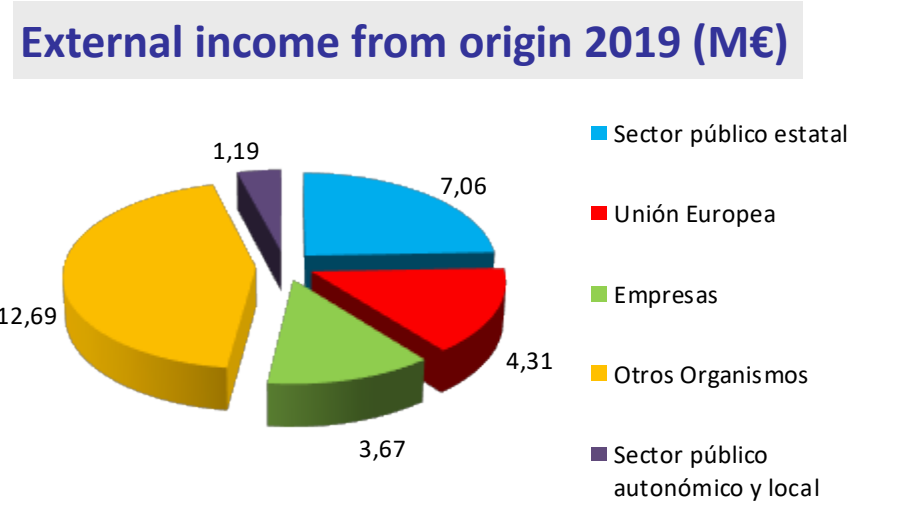
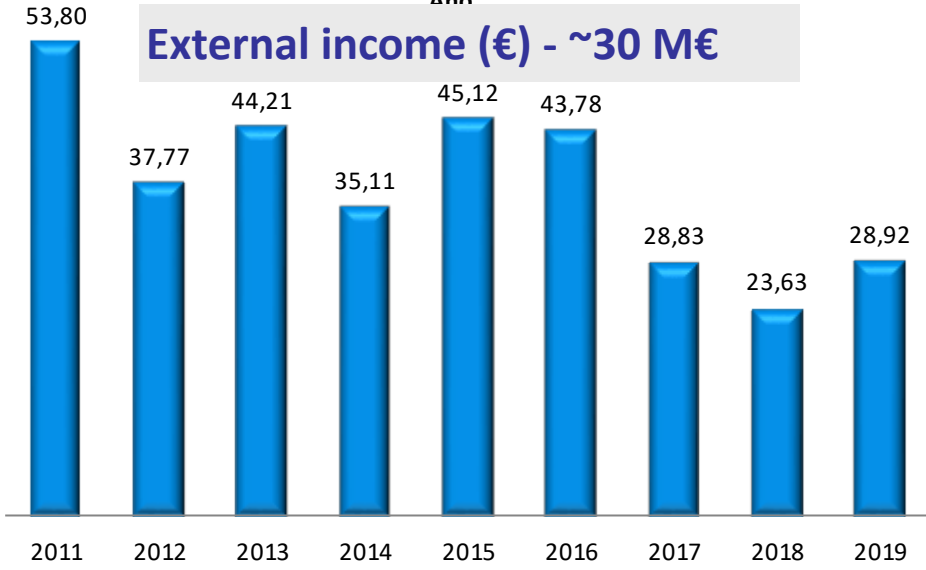
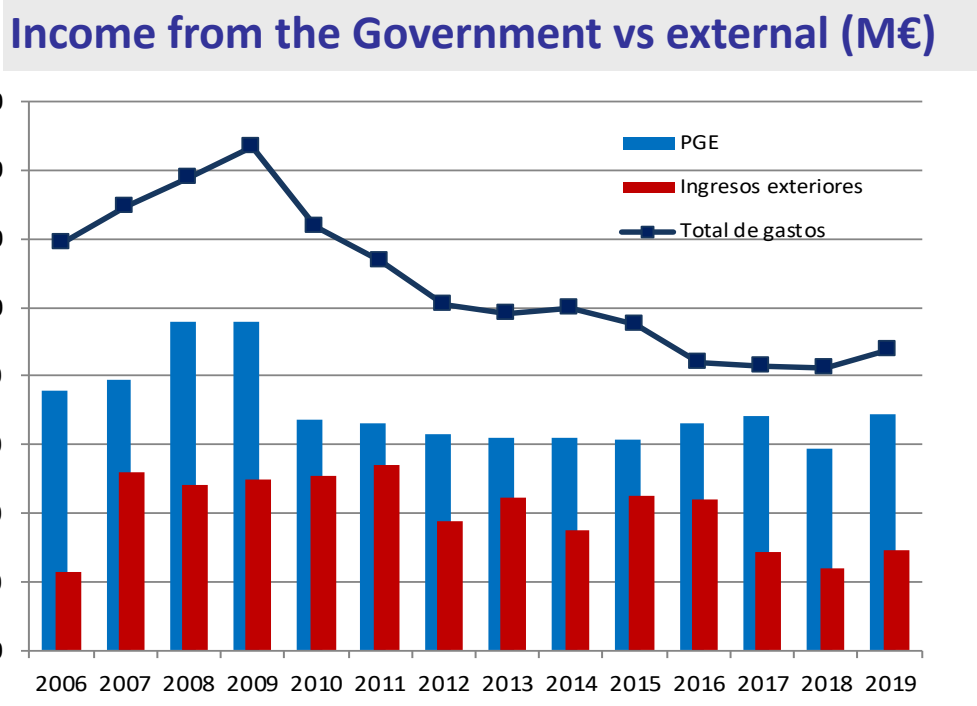
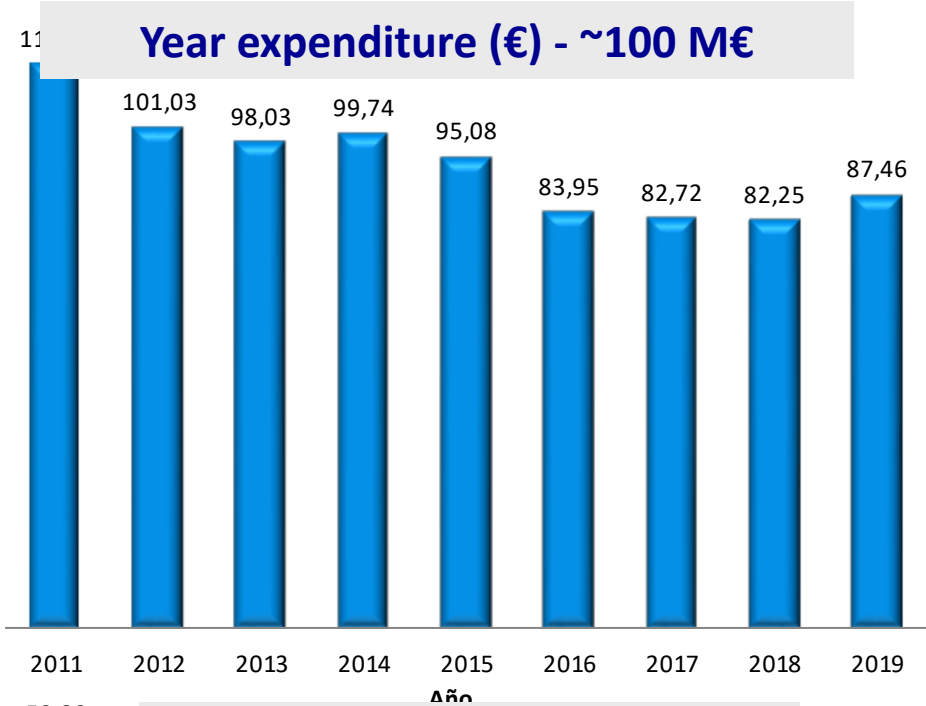


- IB** Basic Research
- IT** Technology Research
- DT** Technology Development
- E** Pilot and Demonstration
- S** Services



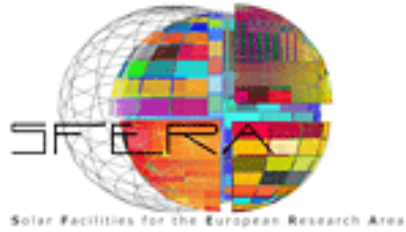
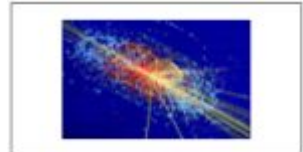
Datos a 31/12/2019

CIEMAT figures. Income



Datos a 31/12/2019

CIEMAT. Presencia Internacional

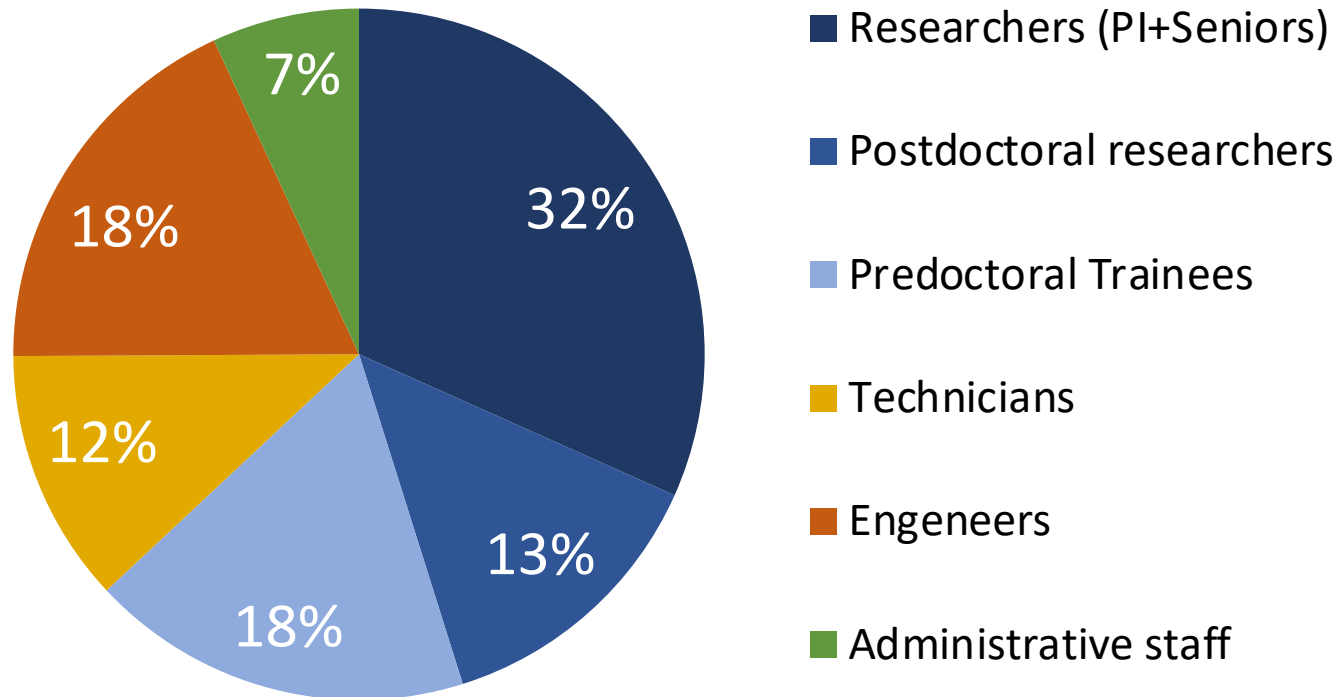


INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION



Particle Physics Personnel

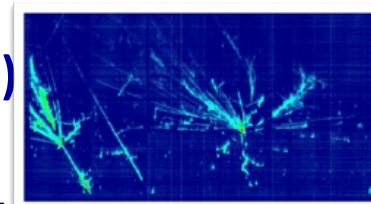
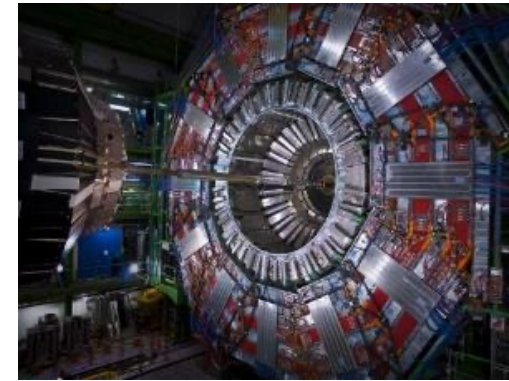
Currently we are **93** people (**24% Female**) (**50% PhD**)



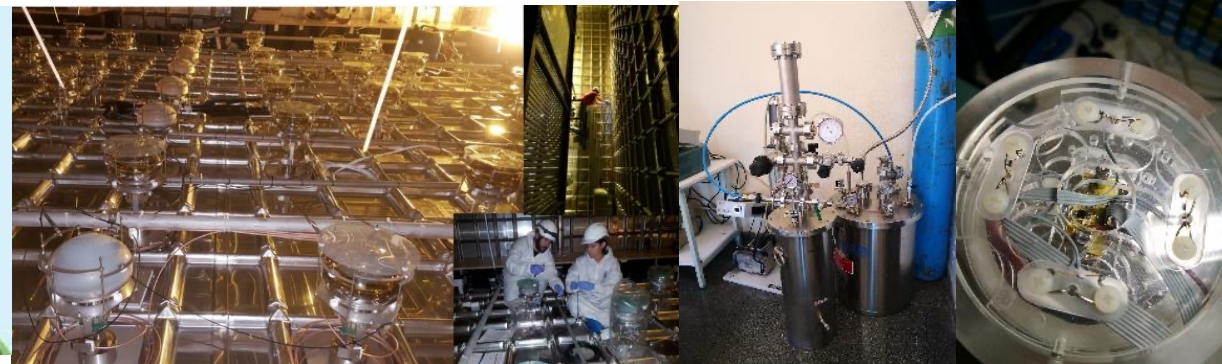
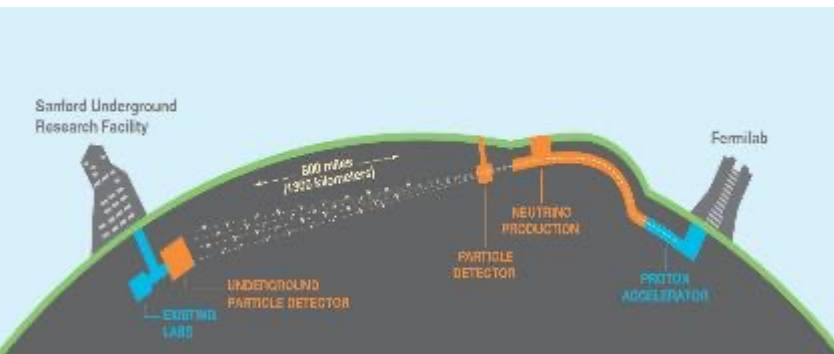
Física y Astrofísica de Partículas

- Experimento CMS en el LHC (CERN)
 - Primera observación del modo de desintegración Higgs $\rightarrow \mu\mu$
 - Más de 1000 artículos en revistas científicas de referencia
 - Preparación de la hoja de ruta para la próxima gran instalación en aceleradores
- Física de Neutrinos (Double Chooz, WA105, DUNE y SBND)
 - Medida de alta precisión del ángulo de mezcla de los neutrinos θ_{13}
 - Medida de la asimetría materia-antimateria en el sector leptónico
 - Sistema de detección de luz en DUNE
- Búsqueda directa de material oscura (ArDM, DarkSide) en Laboratorio Subterráneo Canfranc y Gran Sasso

CMS



Proto-DUNE



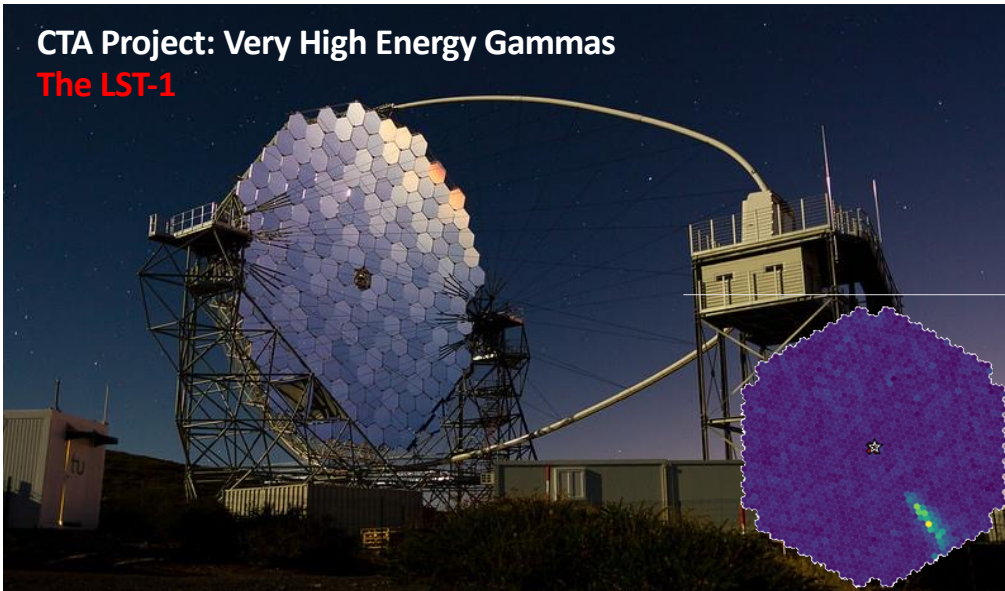
Física y Astrofísica de Partículas

- Experimento AMS en la Estación Espacial Internacional
 - Búsqueda de antimateria y materia oscura
- CTA y MAGIC en El Roque de los Muchachos (La Palma)
 - Procesos extremos en el universo con rayos gamma de muy alta energía
- Cosmología: DES y LSST (Chile), PAU (La Palma), DESI (USA)
 - Estudio de las propiedades de la Energía Oscura



AMS

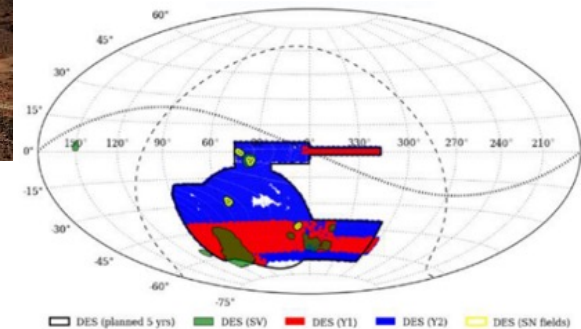
CTA Project: Very High Energy Gammas
The LST-1



Dark Energy Survey (DES): Observational Cosmology to study the properties of Dark Energy



Area of the sky observed by DES in its 6-year project.



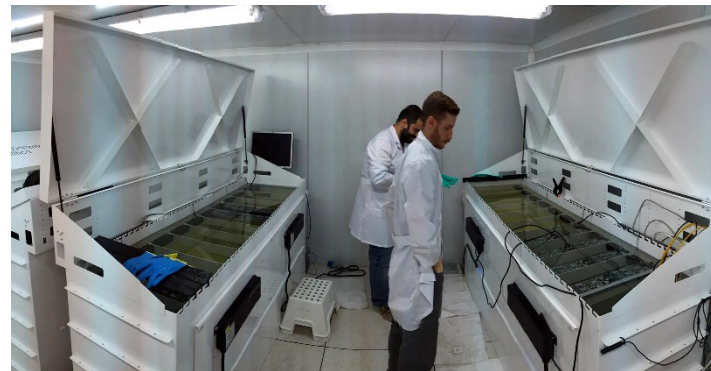
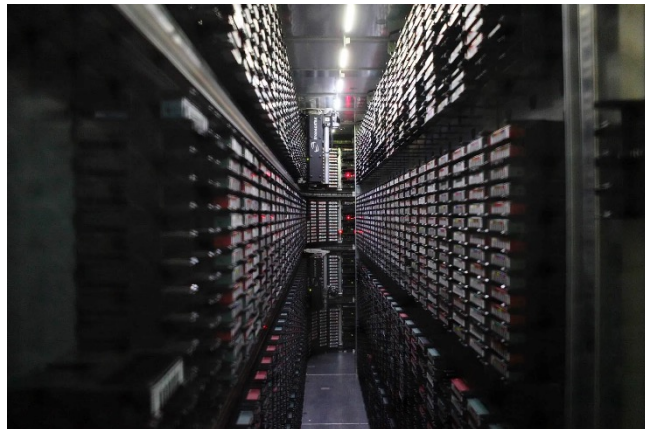
DES Coll. Phys. Rev. Lett. 122, 171301 (2019)

Cosmological Constraints from Multiple Probes in the Dark Energy Survey

Puerto de Información Científica - PIC

PIC (CIEMAT-IFAE) @ UAB

- Convenio de colaboración CIEMAT – IFAE
- Establecido en 2003 y ubicado en la UAB
- **Misión: Participar al más alto nivel en la computación del LHC (Tier-1) y utilizar esta experiencia para dar soporte a otras actividades científicas**
 - Computación distribuida intensiva en datos
 - LHC Tier1 para ATLAS, CMS, LHCb
 - Tier0 para MAGIC y PAU. Science Data Center para Euclid. Centro de datos para el futuro CTA-O.
 - Computación para DES, T2K, DUNE, Virgo/Ligo
 - Nodo de datos Red Española de Supercomputación ICTS

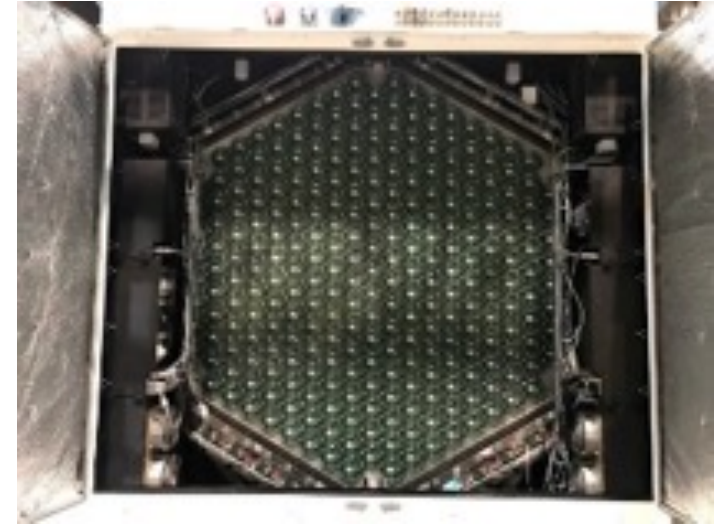


Technology Dep. Support

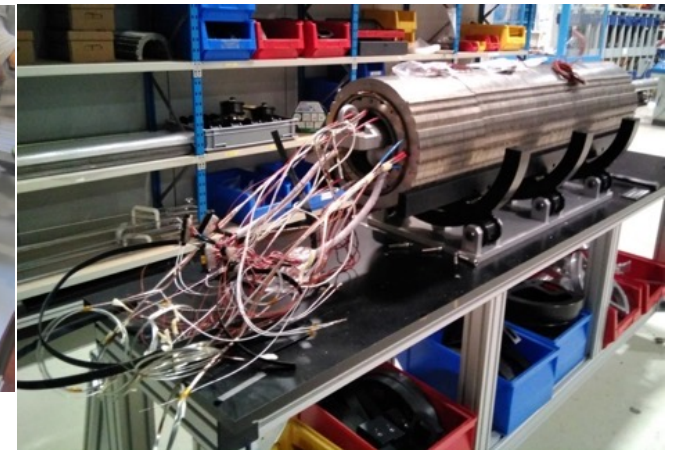
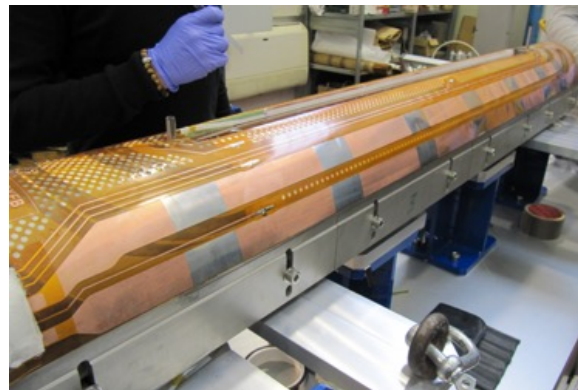
Electronic instrumentation



CLIC



Superconducting magnets HL-LHC & FCC



The CIEMAT Particle Physics Unit wants to collaborate in the Einstein Telescope challenge

- Nowadays we have not expertise in GW detection but with a growing interest among our researchers
- GW have large synergies with our current research areas: Multi-messenger, Cosmology, DM, DE
- We want to open a new activity line on GW and look forward to join a GW collaboration in a short/medium term
- As we did in previous large collaborations, we want to participate in the ET design and construction

VIRGO/LIGO opportunistic access to PIC

In place since Jul 2019

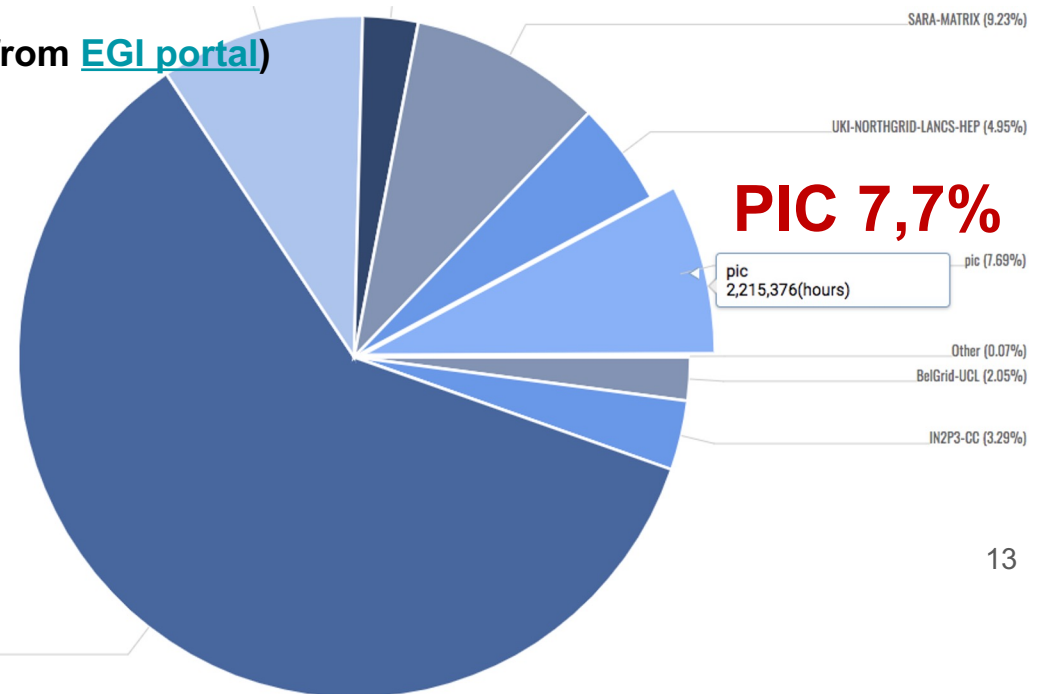
- VIRGO CPU 2020: 2.2 Mhrs at PIC, 3rd top EU country after IT and NL (~8% contribution)
- VIRGO GPU 2020: 8 khr at PIC, top (only) EU contributor (~4% contribution)

GPU hours (from [OSG portal](#))



	total
LIGO-CIT-CE	90 K
Crane	70 K
LIGO-WA-CE	46 K
SDSC-PRP	13 K
LIGO_US_LSU_QB2	13 K
pic	8 K
ND - CAML_GPU	469
ND - CMS_GPU	81

CPU hours (from [EGI portal](#))



INFN-TI (60.23%)

High Energy Physics & Astroparticles

- CMS Experiment at the LHC (CERN)
- Neutrino (DUNE, Double Chooz y WA105)
- Dark matter direct search (DarkSide, ArDM)

- AMS Experiment at the ISS
- CTA and MAGIC at Roque de los Muchachos
- Cosmology, Dark Energy: (DES,PAU)

- Detector R&D
- Scientific Computing – PIC

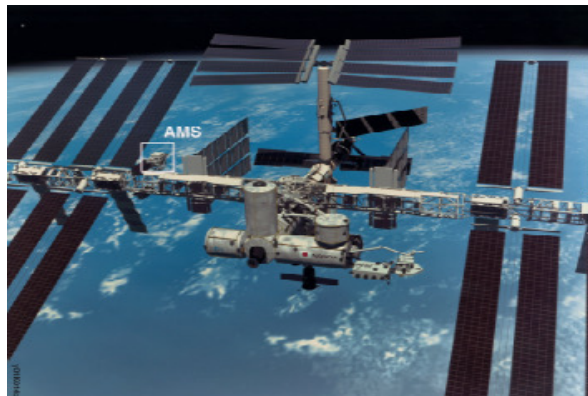
CMS



CTA Project: Very High Energy Gammas
The LST-1



AMS



Proto-DUNE



PIC



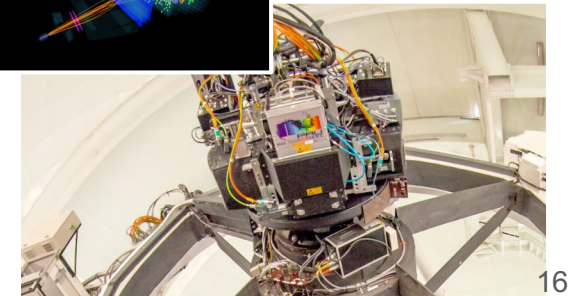
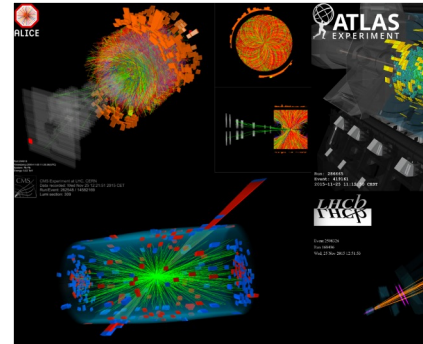
THE END

PIC data center

Collaboration agreement CIEMAT-IFAE. Founded in 2003. Located in UAB (Barcelona).

Mission: Participate at highest level in LHC Computing (Tier-1) and leverage experience to support other scientific activities.

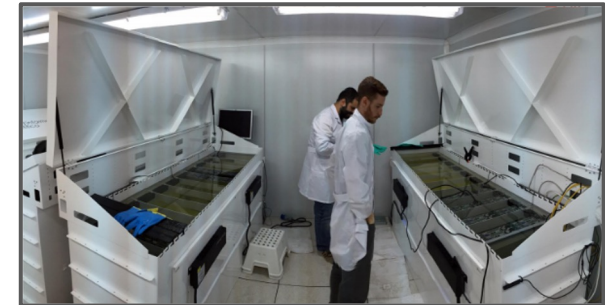
- LHC: Tier1 for ATLAS, CMS, LHCb; Tier2 and Tier3 for ATLAS
- Tier0 for MAGIC and PAU. SDC for Euclid. Data center for the future CTAO.
- Support for DES, T2K, VIP (medical imaging), co2Flux (environmental science)



PIC data center

Data processing services

- 10.000 CPU slots (HTCondor cluster)
- 10 PB disk (dCache) + 25 PB tape (Enstore)
- Bigdata platform (Hadoop/HIVE/Spark)
 - Cosmology analysis web portal & data processing cluster



2x100 Gbps connection to Research Networking

- Largest data mover in Spanish academic network

Compact installation. Refurbished in 2014-2016 to achieve high energy efficiency

- Innovative open bath liquid cooling

