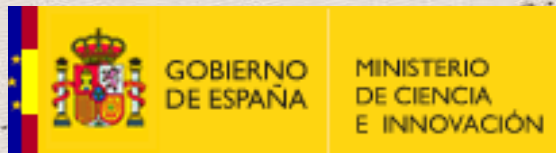


Spanish Activities in Future Colliders: Detectors & Accelerators

Juan A. Fuster Verdú IFIC-València/MICINN

SLHC Workshop
Madrid 5 December 2010





Juan Antonio Rubio

HEP Research in Spain

Areas covered by the program FPA

Particle Physics
Experiment (all) & Theory (all)

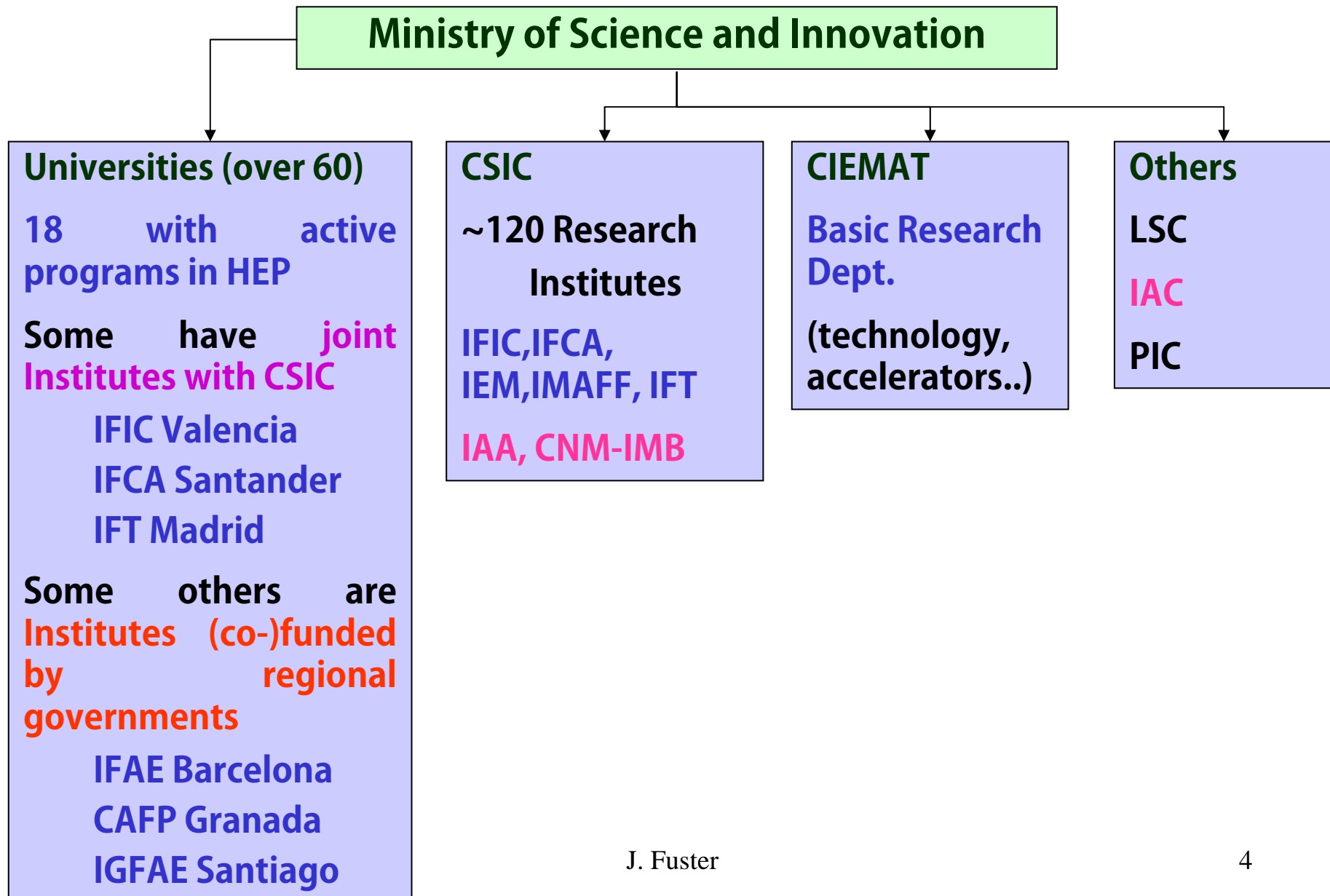
Nuclear Physics
Experiment (all) & Theory (some)

Astroparticle Physics & Cosmology
Experiment (most) & Theory (some)

Information Technology
GRID, e-Science (all)

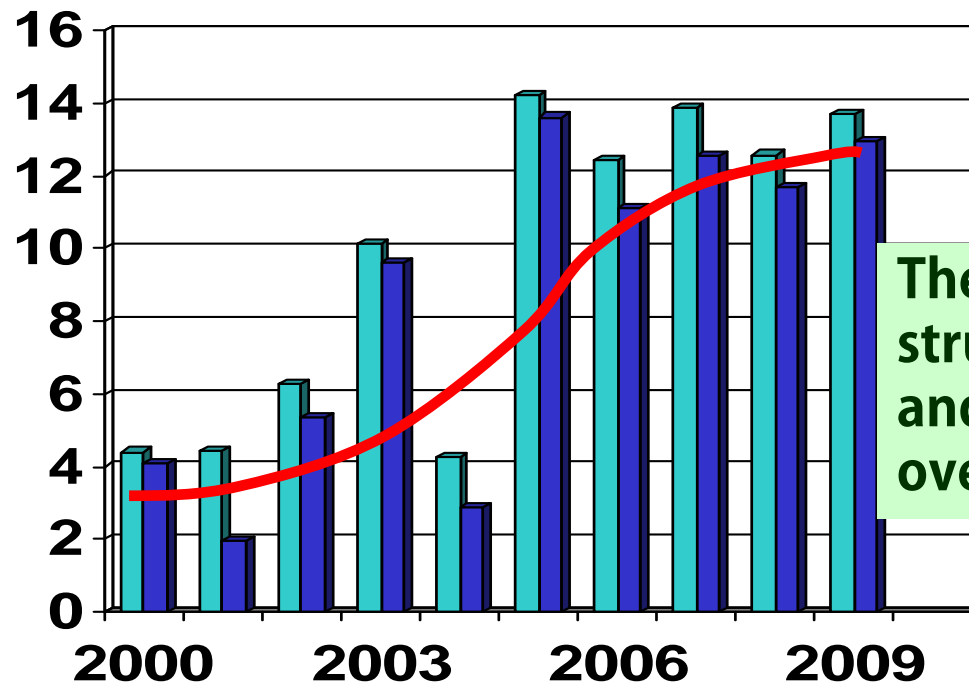
R&D in Accelerators and Detectors
(most)
Physics Applications
Medical Physics (some)

HEP Research in Spain



FPA Funding

■ Projects & Other Actions ■ Only Projects



The three years period structure has been organized and its impact minimized (no overhead considered)

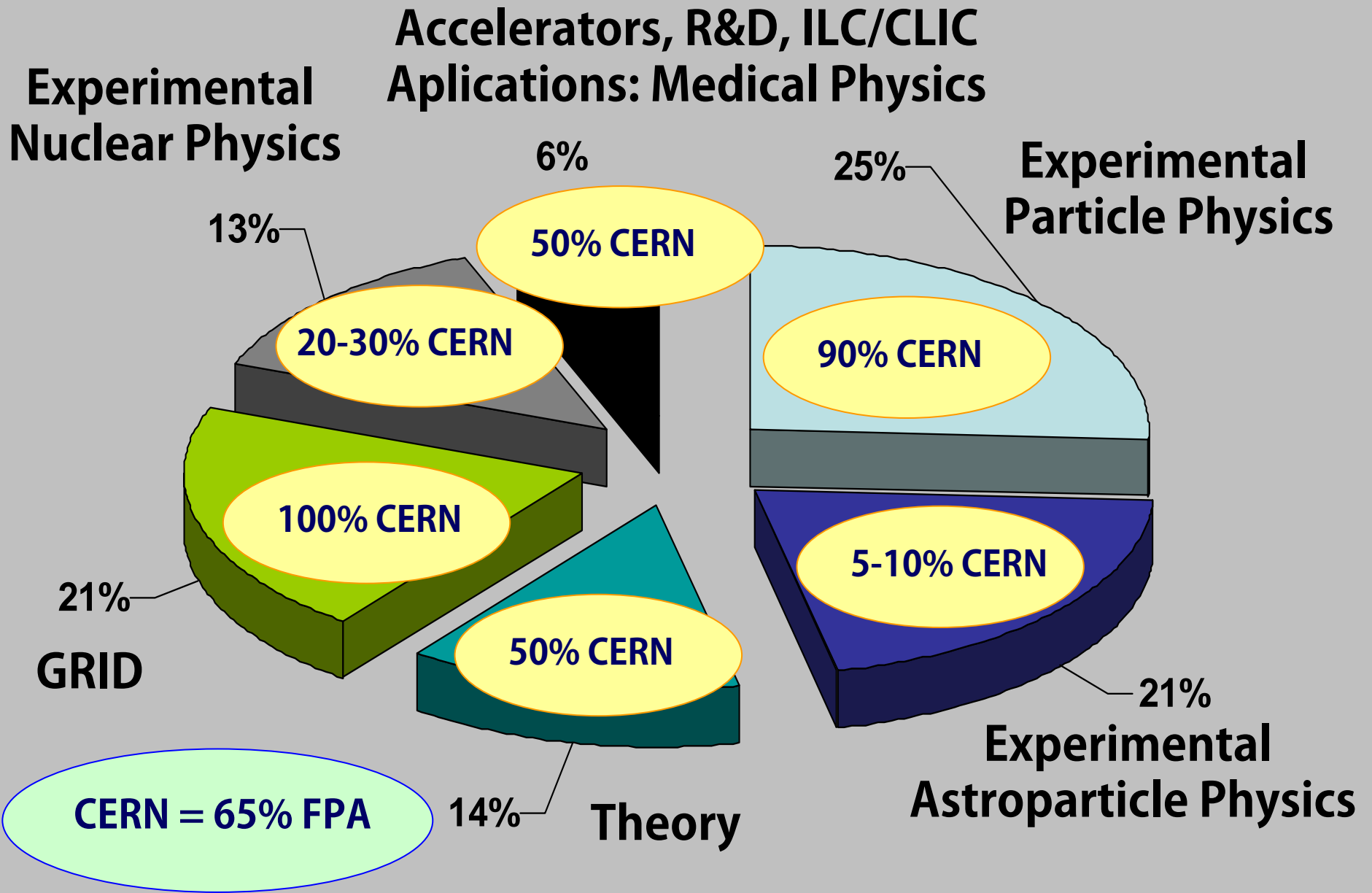
- Only Direct/Operational cost funding is considered (equipment, travelling, personnel)
- Complementary Actions: MoUs, conferences, strategic actions
- 5th contributor to the CERN budget (8,5% ~60M€, 2009).

HEP Funding: Bilateral Agreements

Traditional with INFN and IN2P3 and with Portugal and Argentina since 2006
(total of ~350 Keuros/year)

Year 2008	Spanish Travels	Foreign Travels	Days of Spanish Physicist	Days of Foreign Physicists
Argentina	15	18	448	360
Italia (INFN)	79	93	1102	884
Francia (IN2P3)	71	67	549	460
Portugal	12	16	114	122
Total	177	194	2213	1826

Cooperation with Germany Operational since 2010 with DESY



HEP Funding Sharing: FPA2006-2008

Distribución del personal FPA en España (solo se consideran miembros financiados por el PNFFPA 2006-2008)

	Total	Theory	Experiment
Doctors	496	202	294
PhD Students	187	58	129
Engineers, technicians, etc..	79	2	77
Collaborators	116	70	46
Total	878	332	546
Permanent Staff	282	114	168
Ramón y Cajal	47	22	25
Juan de la Cierva	25	9	16

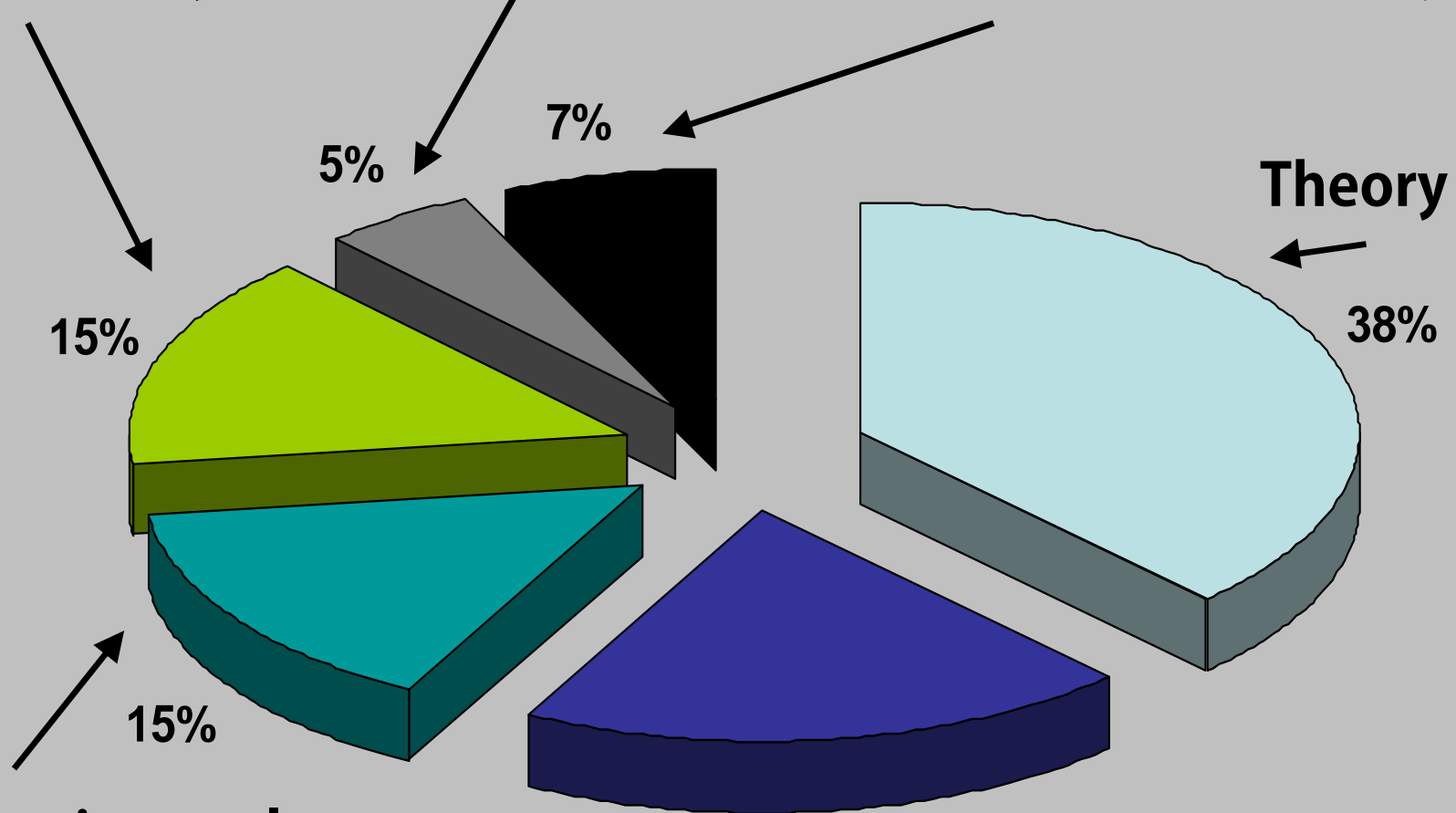
Distribución de EDPs FPA en España (solo se consideran miembros financiados por el PNFFPA 2006-2008)

	Accelerator Particle Physics	Astroparticle Physics	Nuclear Physics	Comp./GRID	R&D Accelerators Med. Phys.
Doctors	88	67	84	17	41
PhD Students	64	33	23	4	6
Engineers, technicians, etc..	22	13	15	19	9
Collaborators	4	21	11	6	4
Total	178	134	133	45	60
Permanent Staff	50	32	48	11	28
Ramón y Cajal	9	9	4	1	3
Juan de la Cierva	5	5	6	0	1

**Experimental
Nuclear Physics**

GRID

**Accelerators, R&D, ILC
Applications: Medical Physics**



Theory

15%

5%

7%

38%

15%

20%

**Experimental
Astro-Particle Physics**

**Experimental
Particle Physics**

HEP Activity (FTEs)

Organizational and Coordination Issues

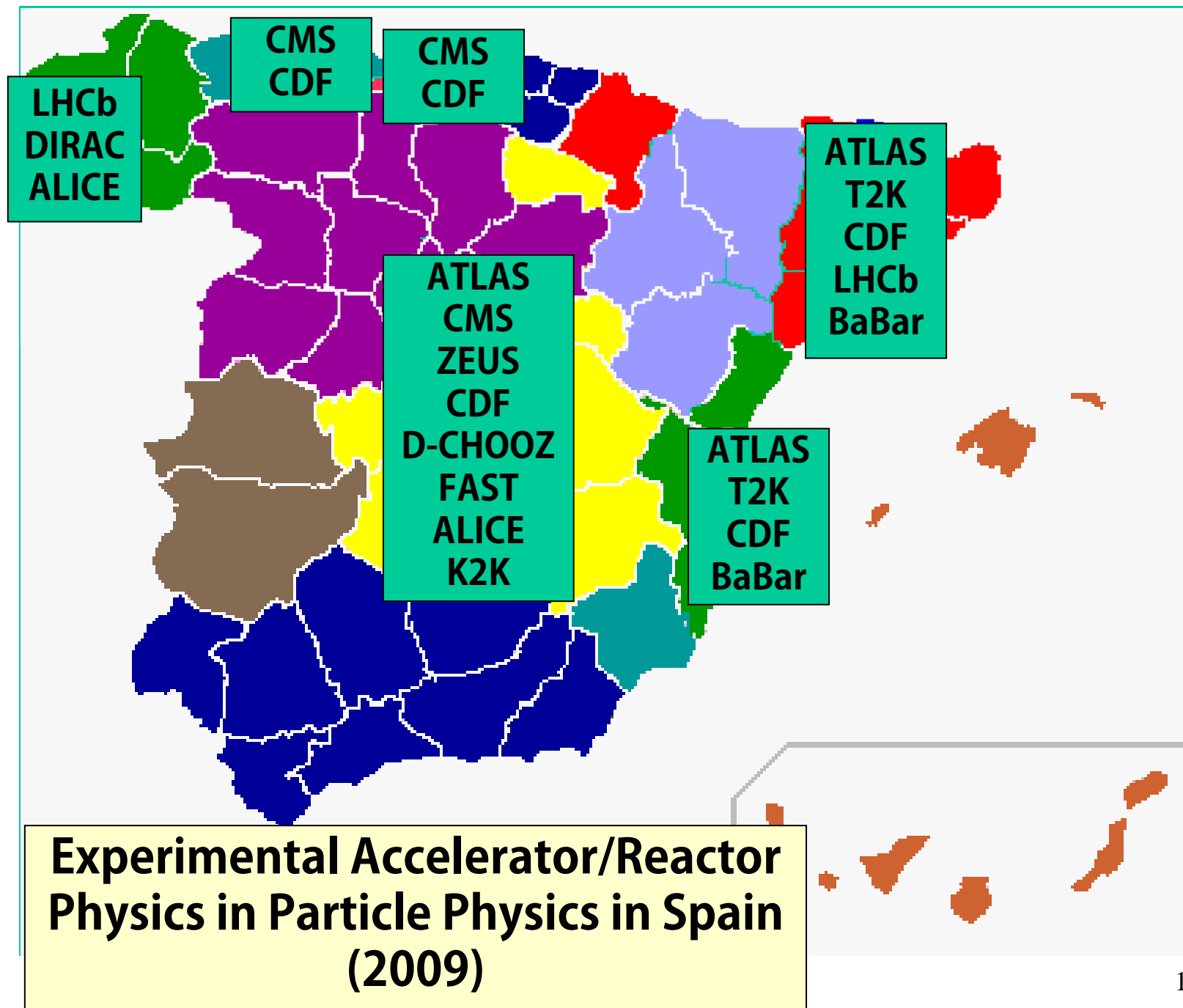
European ERANETs (Funding Agencies Networks):

- ASPERA (Astroparticle Physics)
- NUPNET (Nuclear Physics)

National NETs:

- LHC, Experiment & Theory
- R&D for future colliders (Detector+Accelerators)
- Nuclear Physics
- RENATA, Astroparticle Physics & Neutrino Physics
- Coordination workshops, meetings, etc.. (Spanish Winter Meeting, TAE, etc..) organized at Benasque Center Professor Pere Pascual

Spain has recently joined SCOAP³ CERN initiative for an Open Access publication system for HEP



Spanish Participation in LHC



GRID:
Tier 1
4 Tier 2

**LHC : 27 km long
~100m underground**



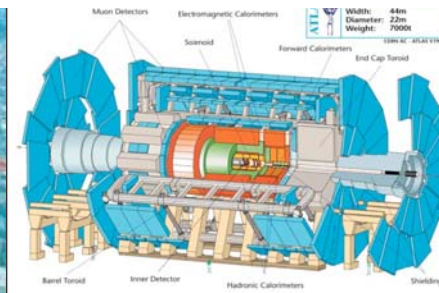
**Spanish Contribution:
as CERN Member**



**Pp, B-physics, CPV
LHCb**

**Spanish Contribution:
InTrk, ScintPaDet**

**Spanish Contribution:
SCT, Ecal-LAr, TiCal,**

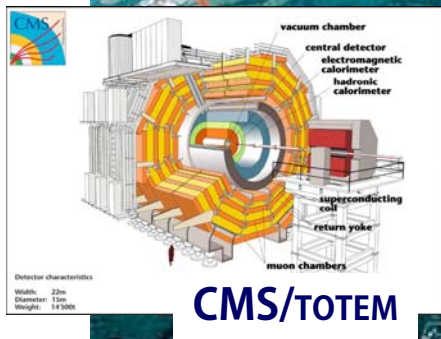
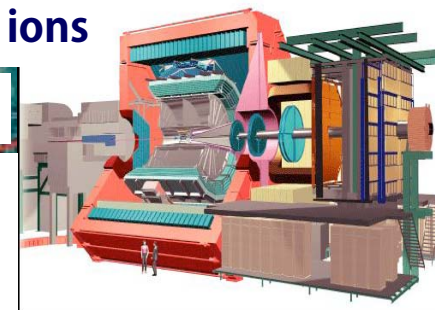


ATLAS/LHCf

**General Purpose,
pp, heavy ions**

**Spanish Contribution:
 μ -system,**

**Heavy ions
ALICE**



CMS/TOTEM

**Spanish Contribution:
Computing,**

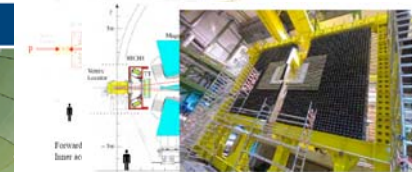
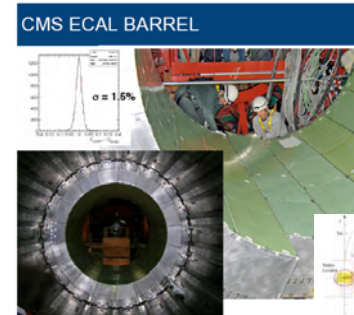
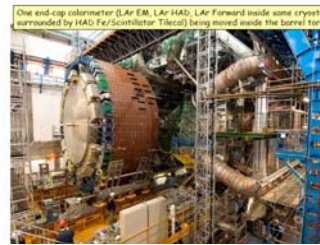
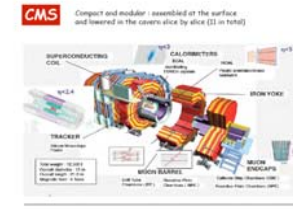
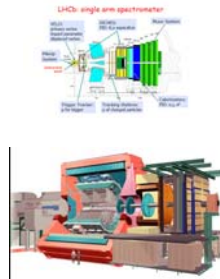
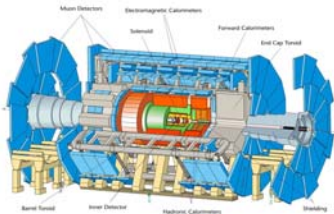
ATLAS+CMS+LHCb+ALICE being completed...start... 2009!

Spanish Contributions

ATLAS 2,1%
 CMS 1,8%
 LHCb 2,7%
 ALICE 0.5%

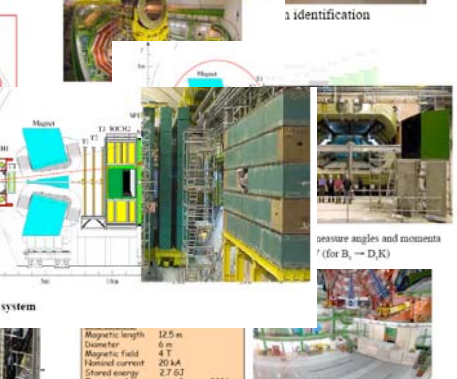
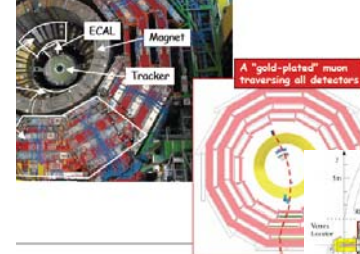
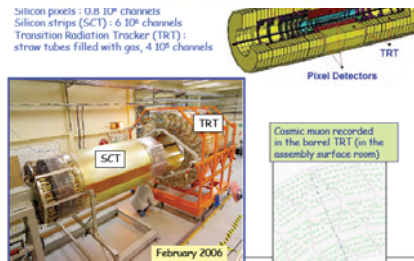
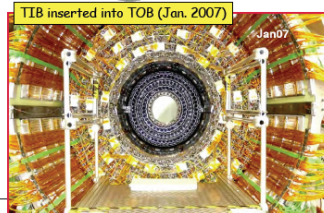
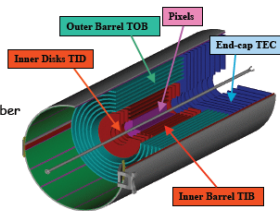
Spanish Participation

ATLAS ~85/2500 3,4%
 CMS ~50/2000 2,5%
 LHCb ~33/690 4,8%
 ALICE ~9/1000 0.9%



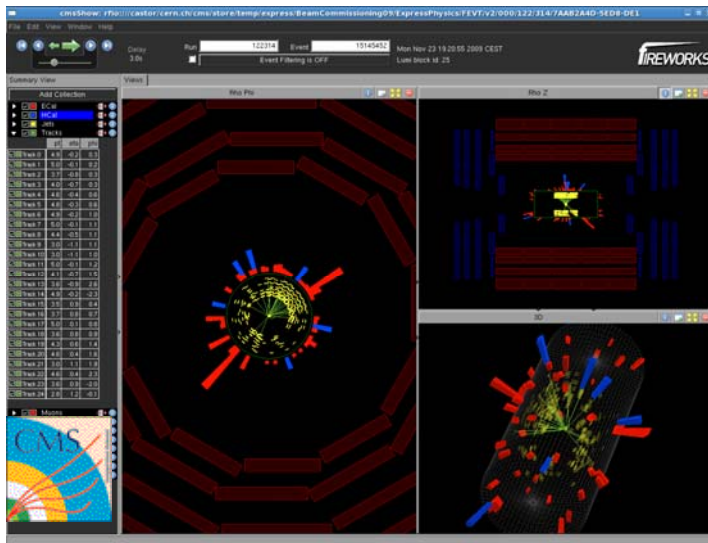
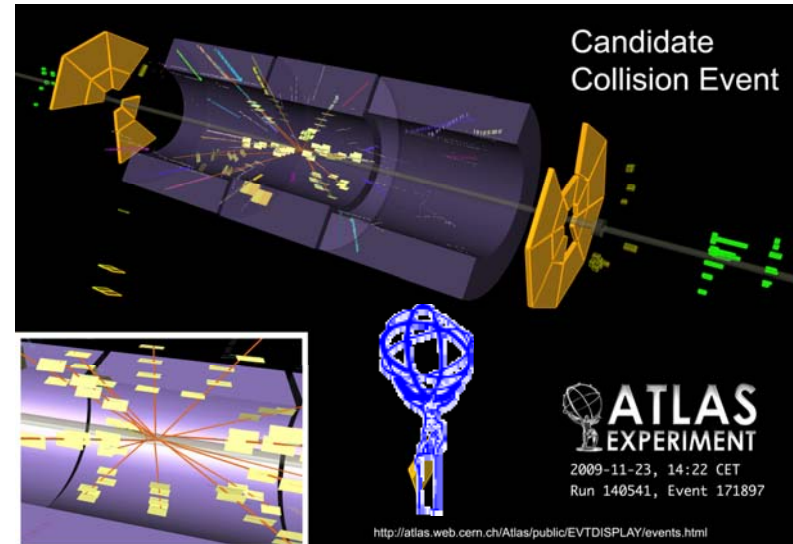
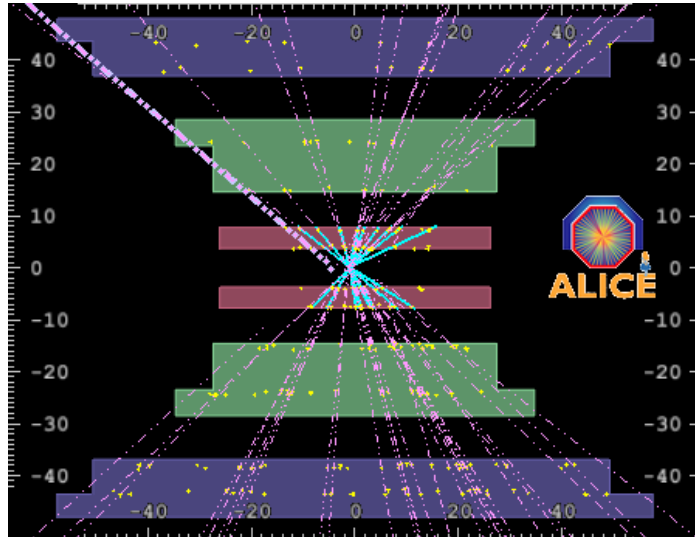
CMS Inner tracker:
 ~ 220 m² of Si sensors
 10.6 million Si strips
 65.9 million Pixels

Installation in underground cavern in September

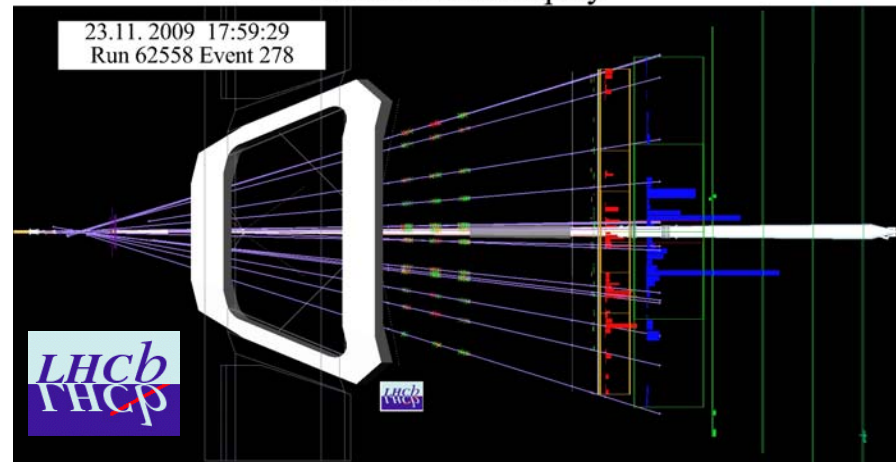


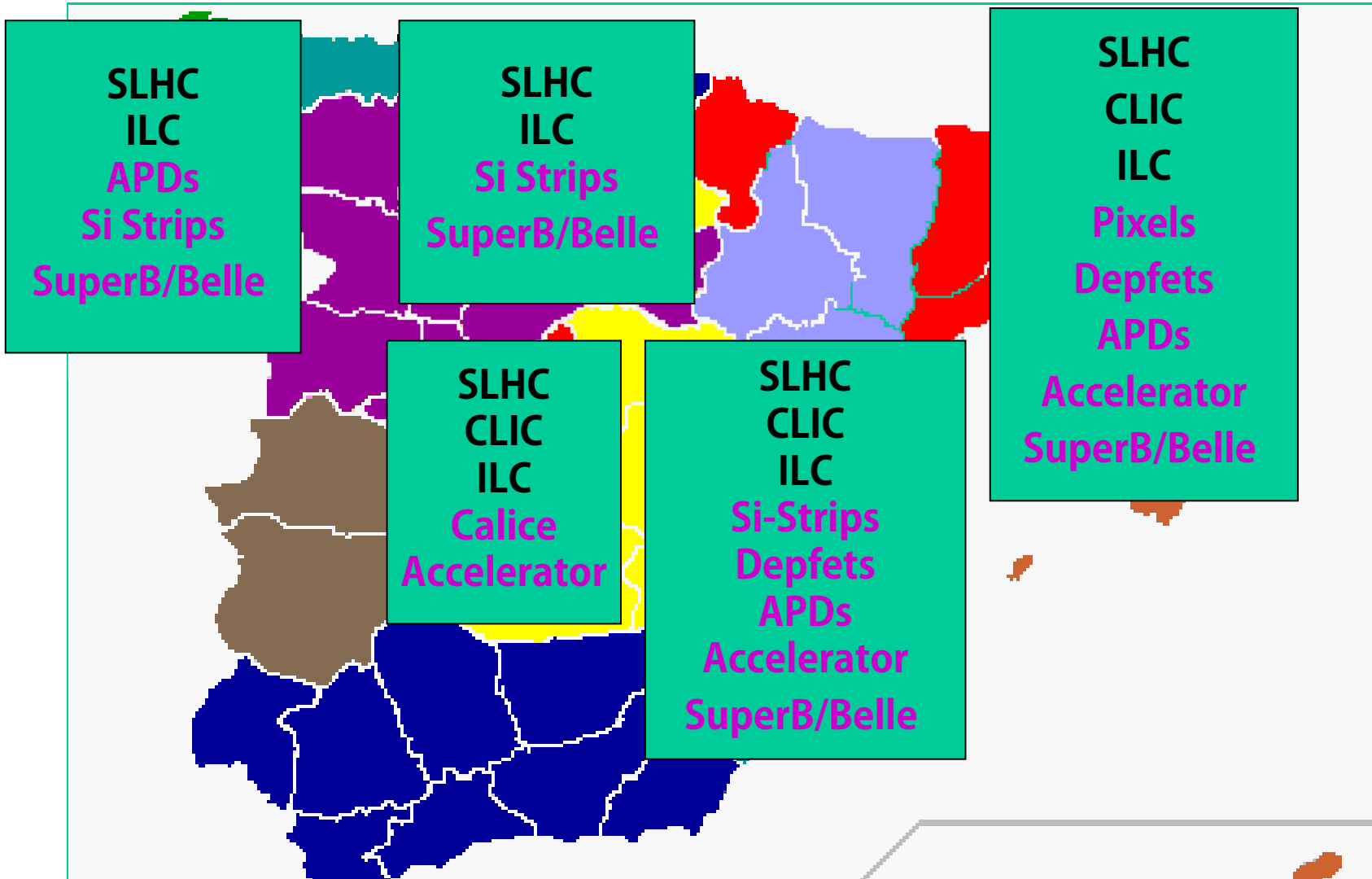
Magnetic length 12.5 m
 Diameter 6 m
 Magnetic field 4 T
 Nominal current 20 kA
 Stored energy 2.7 GJ
 Started of full current in Summer 2006

The LHC “est arrivé” (23-11-2009)



LHCb Event Display





R+D/Interests in Spain “known in 2009” for Accelerator Particle Physics in Accelerators and Detectors

Activities in Spain for Future Colliders

Two Networks:

- LHC, Experiment & Theory (SLHC)
- R & D for Future Colliders (Detectors + Accelerators, ILC, CLIC, Super B Factories)

Activities in Detectors:

- SLHC, natural extensions of present contributions + Pixels (IFAE-ATLAS)+Tracker (IFCA-CMS)
- ILC, EndCap, DEPFET, APDs (Pixels), SiLC (Tracker), CALICE (Cal.)
- Belle II/SuperB, tracker

European Projects:

- EUDET
- AIDA (future)
- ENVISION-ENLIGHT (Medical Physics)

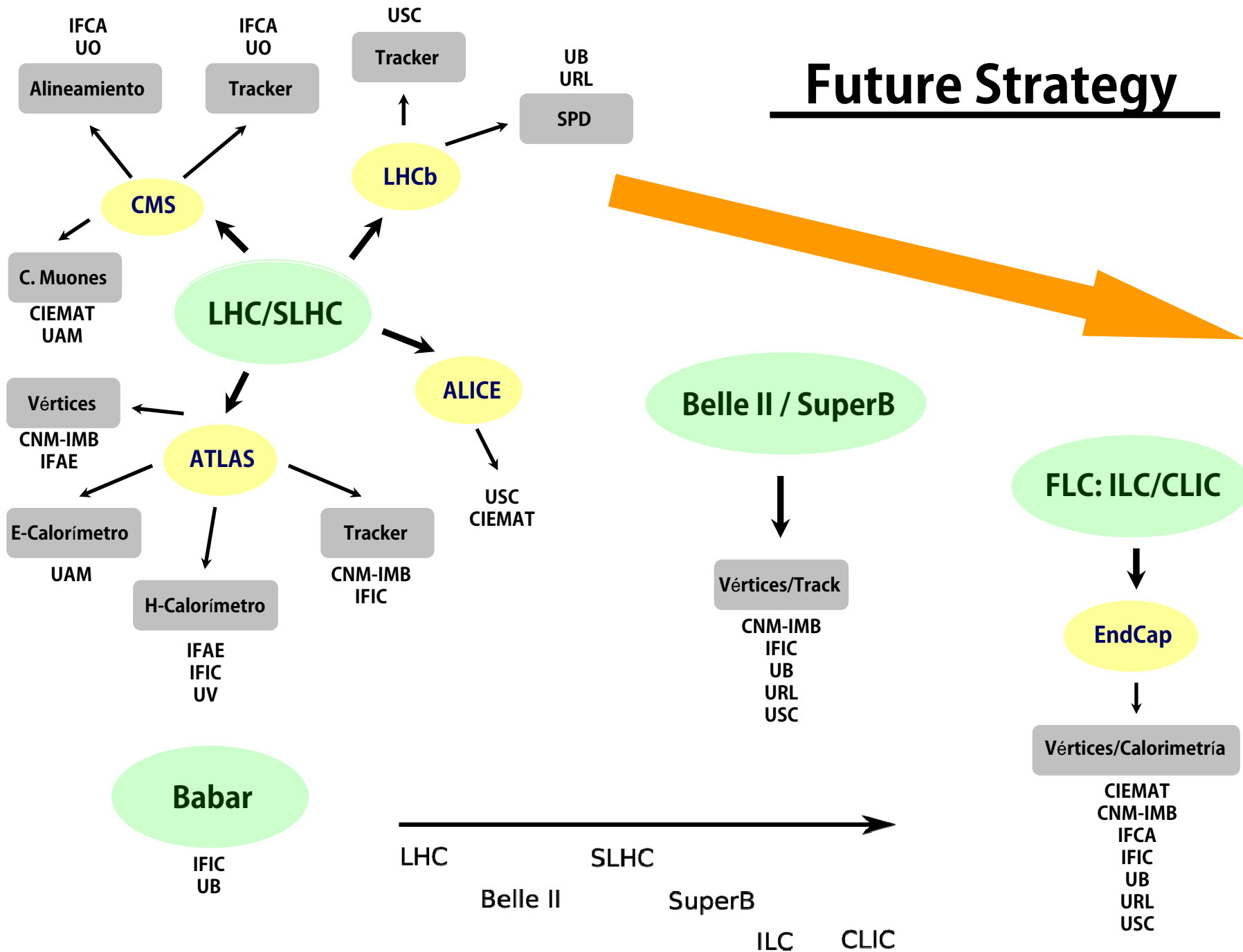
Activities in Accelerators:

- ILC (Test Facility ATF2), OTR + FONT4 (IFIC), TESLA500+MLQ (CIEMAT)
- CLIC (Test Facility CTF3), PETS+KICKERS (CIEMAT), BPS (IFIC. UPC)

European Projects:

- EUCARD, SLHC-PP
- PARTNER-ENLIGHT (Medical Physics)
- TIARA (future)

Future Strategy



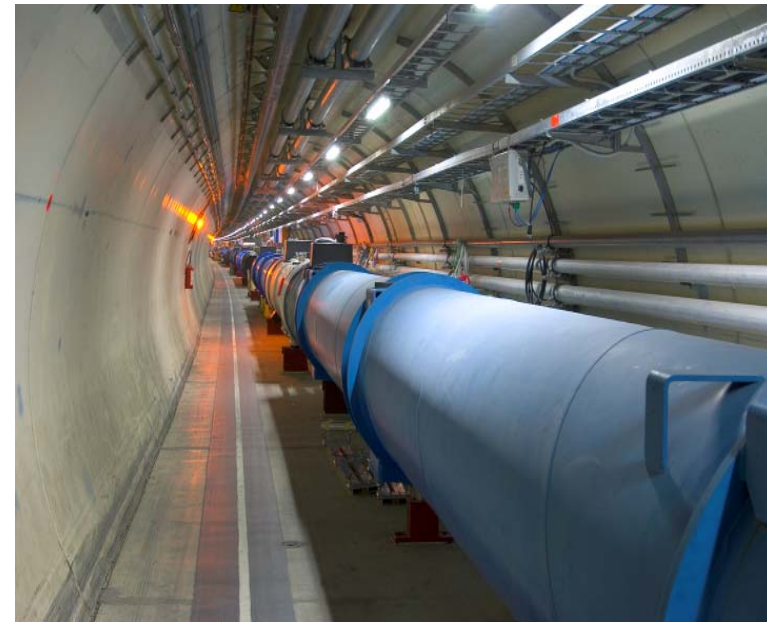
Spanish Industrial Participation example: LHC

CERN - SPANISH INDUSTRIAL RETURN FOR LHC PROJECT

Spain is the **5th country** with greater industrial return in LHC Project



LHC PROJECT	Payments and Outstanding commitments to Spanish companies (CHF)(*)	%
Machine & Experimental areas	184.423.000	6.2
LHC Experiments (ALICE, ATLAS, CMS, LHCb)	4.233.000	2.7
Total	188.656.000	



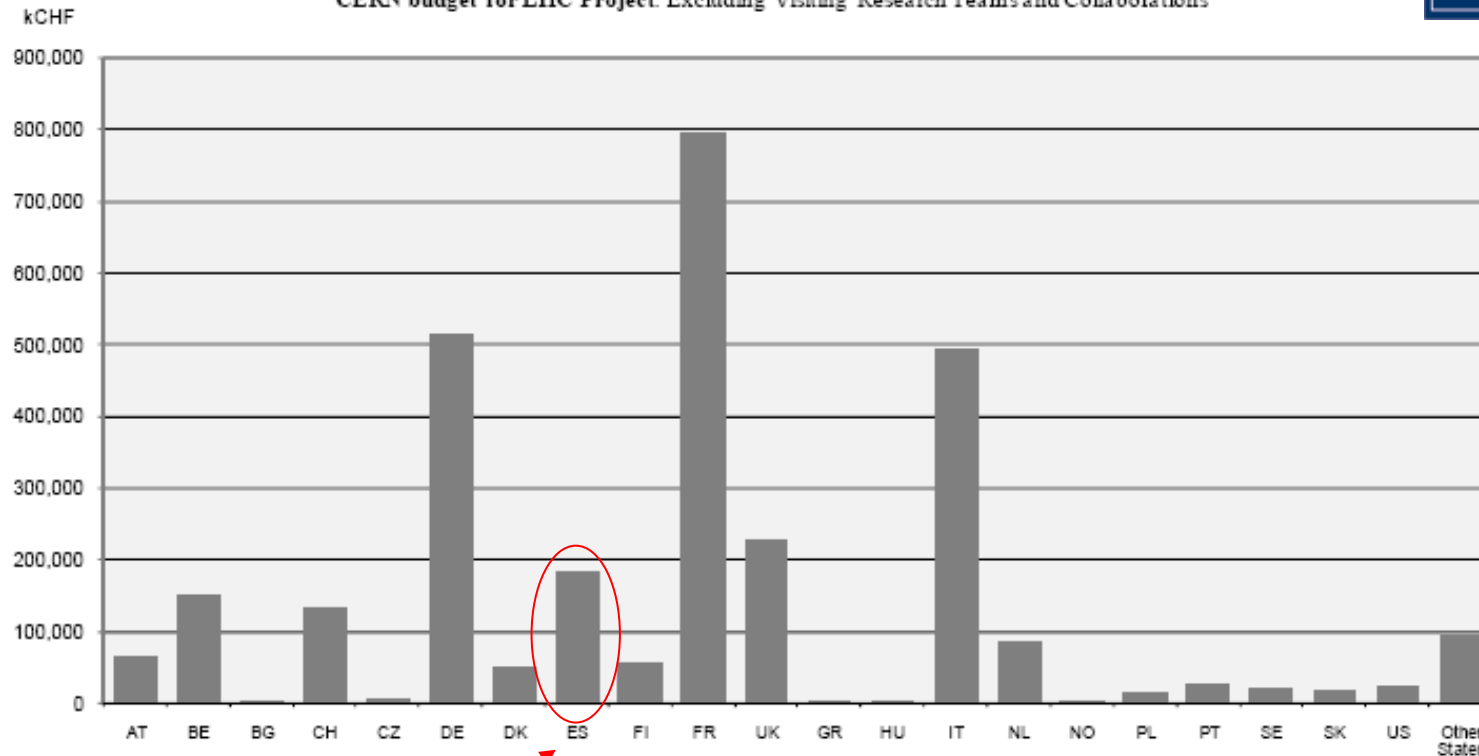
(*) From 1 January 1995 to 31 March 2008. Visiting research teams and collaborations are not included

Spanish Industrial Participation example: LHC

CERN - SPANISH INDUSTRIAL RETURN FOR LHC PROJECT



Payments and outstanding commitments for the period 1 January 1995 to 31 March 2008.
Adjudications for supplies by the Finance Committee up to March 2008 are also included.
CERN budget for LHC Project. Excluding Visiting Research Teams and Collaborations



Payments and outstanding commitments for the period 1 January 1995 – 31 March 2008.

*From CDTI,
M. Serrano & P. Dorado*

Spanish Industrial Participation example: LHC

CERN - SPANISH INDUSTRIAL RETURN FOR LHC PROJECT

More than 35 Spanish companies have participated at LHC



Civil engineering and buildings:

- EMPRESARIOS AGRUPADOS
- DRAGADOS
- IDOM

Electrical engineering:

- JEMA
- ANTEC
- CROVISA

Mechanical structures :

- FELGUERA CONSTRUCCIONES MECÁNICAS
- ASTURFEITO
- NORTEMECÁNICA
- ELAY

Vacuum and low-temperature technology

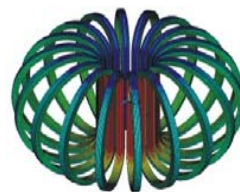
- TELSTAR
- VACUUM PROJETS

Electronics

- GTD
- CRISA
- INSYTE
- SAIFOR

Industrial Services

- IBERINCO
- SENER
- INTECSA-INARSA
- TAM
- AXIMA
- SIDASA



From CDTI,
M. Serrano & P. Dorado



5 February 2010

Spanish industrial capacities, experience for ILC/CLIC

For the ILC/CLIC project CDTI has identified components for potential collaborations in the R&D Phase, in major technical areas of the project:

- ***Superconducting RF Technology (SCRF) Technical Area*** (Main LINACs)
 - Superconducting Magnets
 - Cryomodules
 - Power Systems
 - RF Cavities (*)

- ***Conventional Facilities & Siting and Global Systems Technical Area***
 - Civil engineering (Underground and surface)
 - Electrical and cooling systems
 - Control Systems

- ***Accelerator Systems Technical Area***
 - Electron/Positron Source
 - Damping Ring - Kicker structures: drive pulser technology (*)
 - Beam Delivery System - The final focus (FF) : strong compact superconducting quadrupoles

(*) An R&D Program may be targeted for technologies on ILC/CLIC to increase Spanish participation on items of high technological content.

... art !!



Valencia (14-10-09).- La Fura dels Baus se encuentra inmersa en los ensayos de la puesta en escena de Les Troyens de Hector Berlioz, ópera inaugural de la temporada 2009-2010 del Palau de les Arts Reina Sofía. El director de La Fura dels Baus, Carlus Padrissa, ultima en el centro de artes valenciano los detalles de la puesta en escena “futurista y tecnológica” de esta coproducción con el Teatro Marinski de San Petersburgo y el Teatro Wielki de Varsovia, que se estrenará el próximo 31 de octubre en el emblemático edificio de Santiago Calatrava