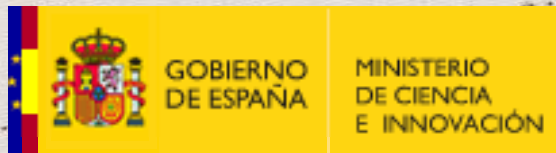


The Spanish National Program for Particle Physics

Juan A. Fuster Verdú IFIC-València/MICINN
València, 16 December 2008



HEP Research in Spain: Topics (as covered by the program FPA)

Particle Physics
Experiment & Theory

Nuclear Physics
Experiment
Some Theory

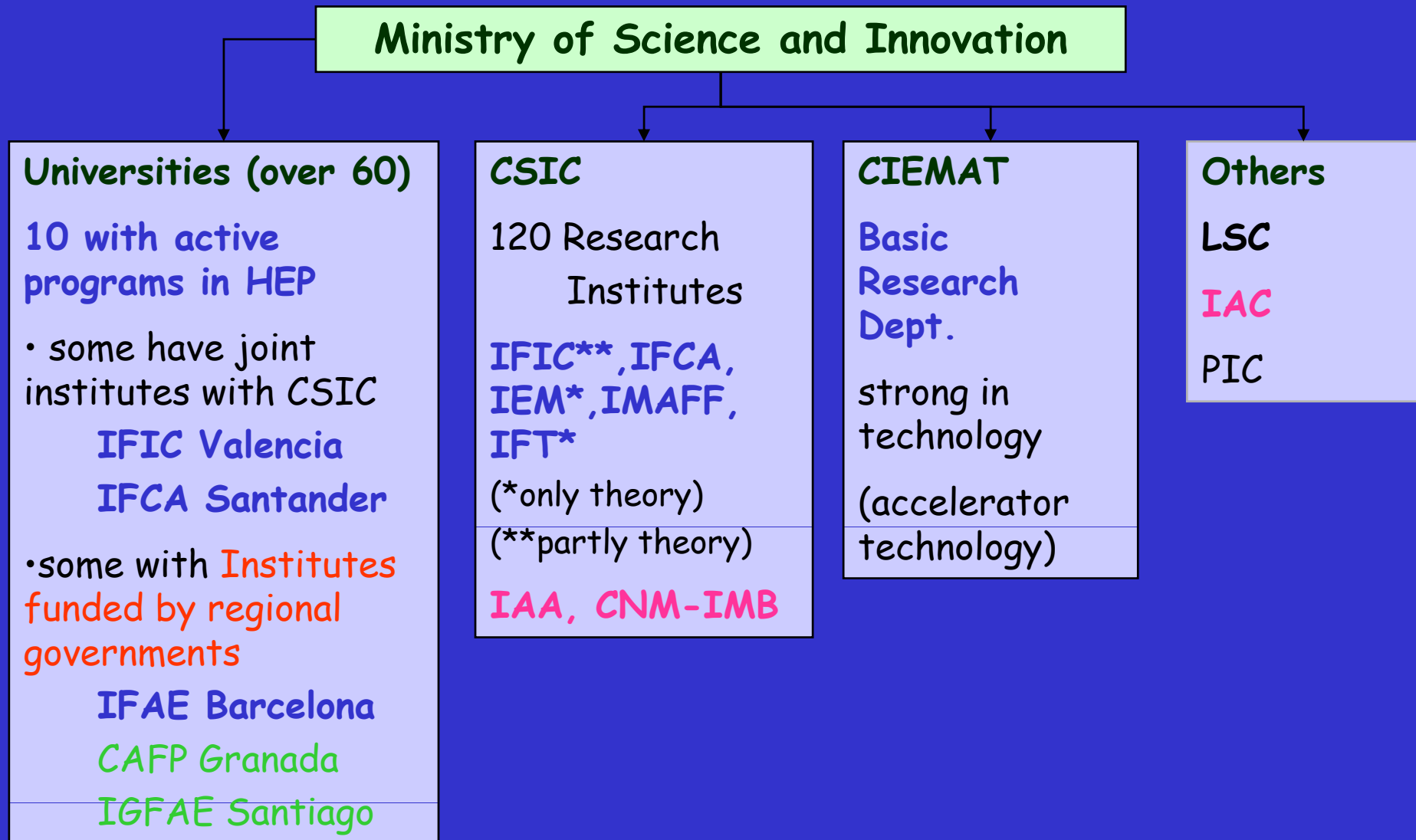
Astroparticle Physics & Cosmology
Theory & Experiment

Information Technology
GRID, e-Science

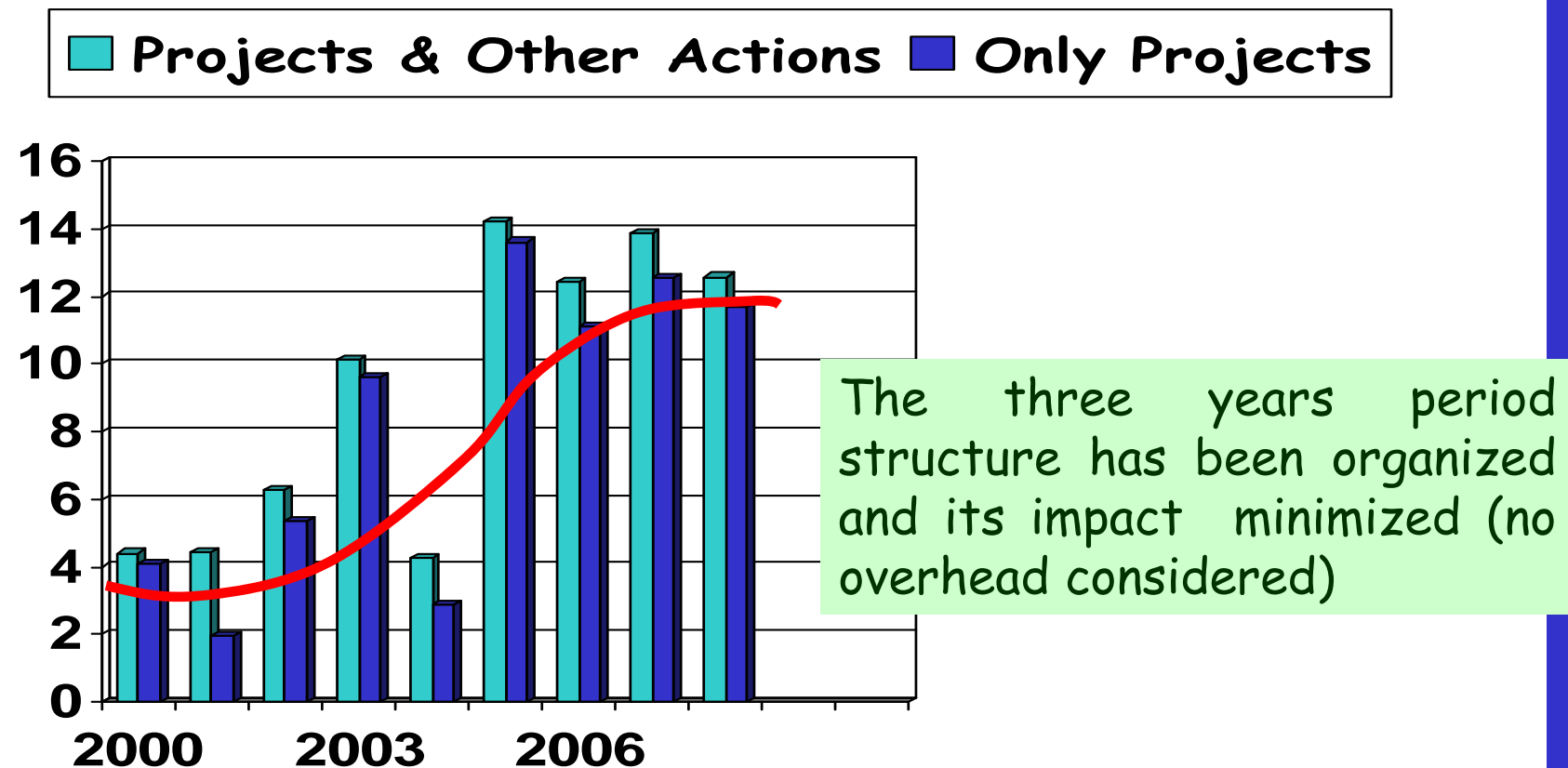
R&D in Accelerators and Detectors

Physics Applications
Medical Physics

HEP Research in Spain



HEP Funding



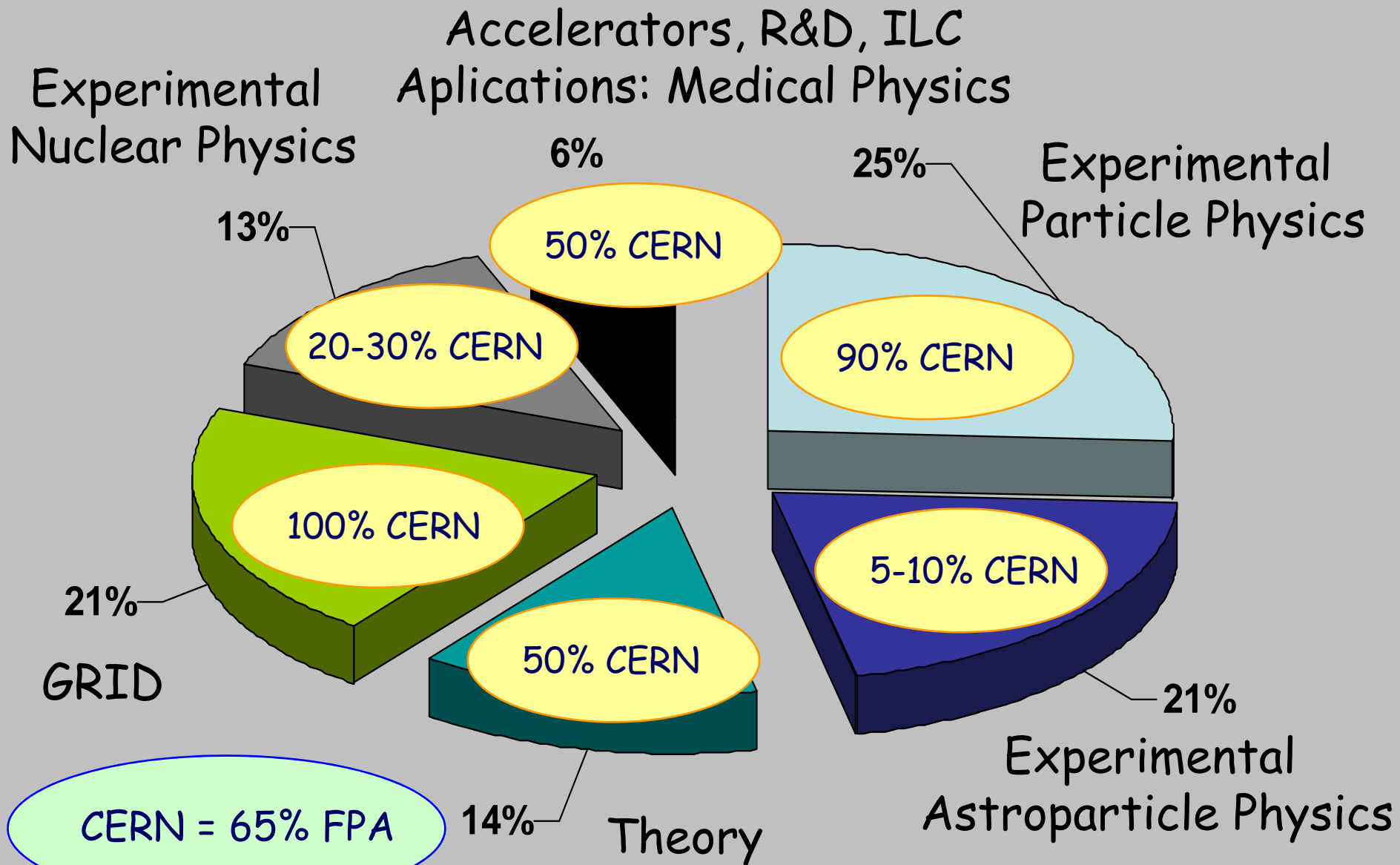
- Only Direct/Operational cost funding is considered (equipment, travelling, personnel)
- Special Actions: MoUs, conferences, strategic actions
- 5th contributor to the CERN budget (8,3% ~54M€).

HEP Funding: Bilateral Agreements

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

Year 2007	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

Conversations with Germany for similar future cooperations is going on



HEP Funding Sharing: FPA2006-2008

HEP staff & graduate students in Spain

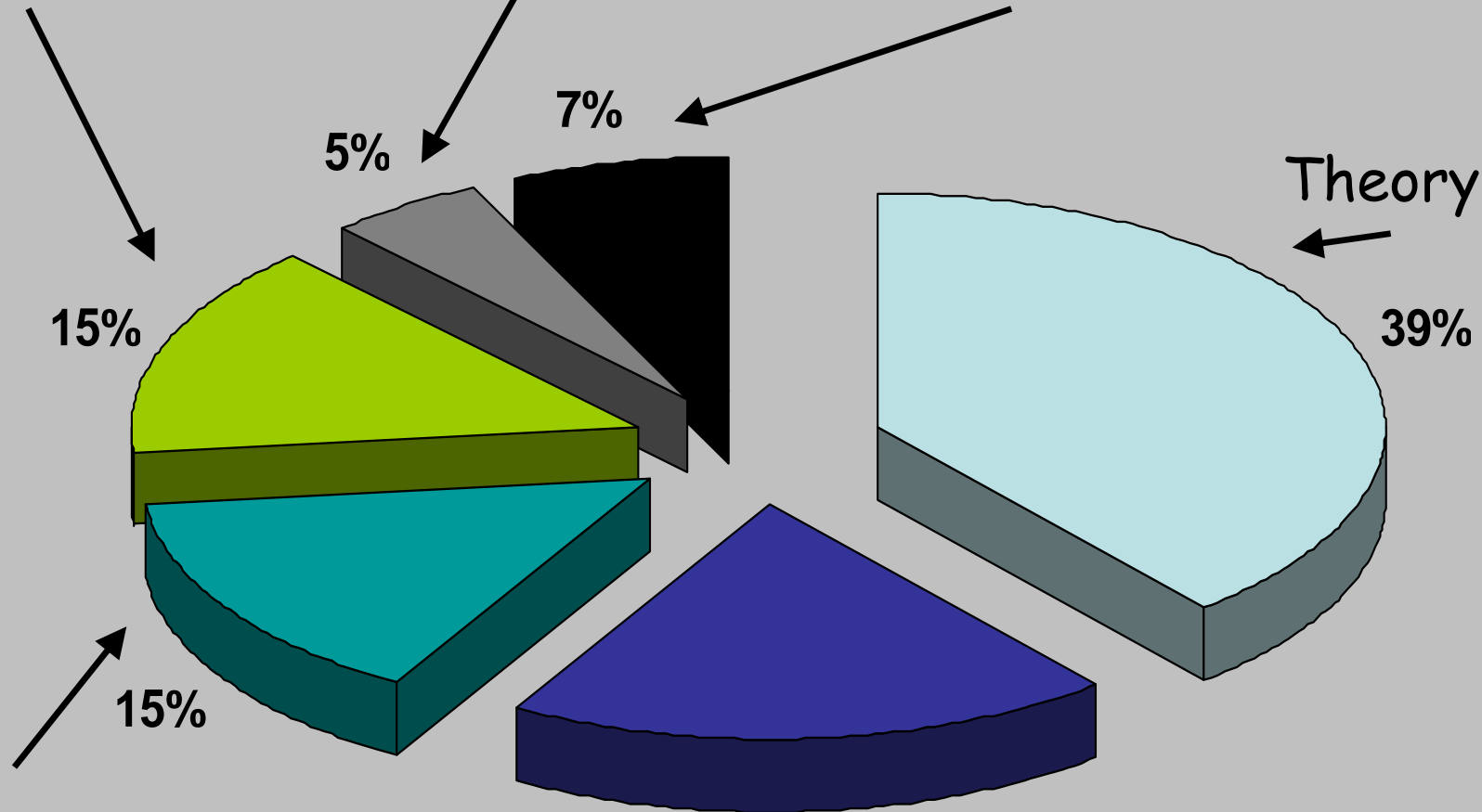
(members of projects supported by PNFPA 2006-2008)

Total EDPs en FPA (2006-2008)		Teóricos	Experimentales	Física de partículas en aceleradores	Astro partículas	Nuclear	Computación (Grid)	I+D & Aceleradores	Física médica
EDPs 2006-2008	830	321	509	160	123	121	42	28	29
Permanentes	286	114	172	50	32	48	11	13	15
No permanentes	544	207	337	111	91	74	31	15	14
Staff (Perm+R&C)	333	136	197	58	41	52	12	15	16
Doctores	409	169	240	74	52	66	12	15	18
Ramónes y Cajales	47	22	25	9	9	4	1	2	1
Juan de la Cierva	25	9	16	5	5	6	0	0	1
Postdoc	52	25	27	11	7	8	1	0	1
Estudiantes PhD	149	47	102	53	26	17	3	1	3
Otras entidades	93	33	61	15	15	18	5	6	2
Técnicos	63	2	61	18	9	9	17	6	2
Sin Clasificar	116	70	46	2	22	12	6	0	4
Estudiantes PhDs concedidos 2006-2008	38	11	27	11	7	6	1	1	1
Técnicos concedidos 2006-2008	18	0	18	5	4	6	2	0	1
EDPs 2006-2008	886	332	554	176	134	133	45	29	31

Experimental
Nuclear Physics

GRID

Accelerators, R&D, ILC
Applications: Medical Physics



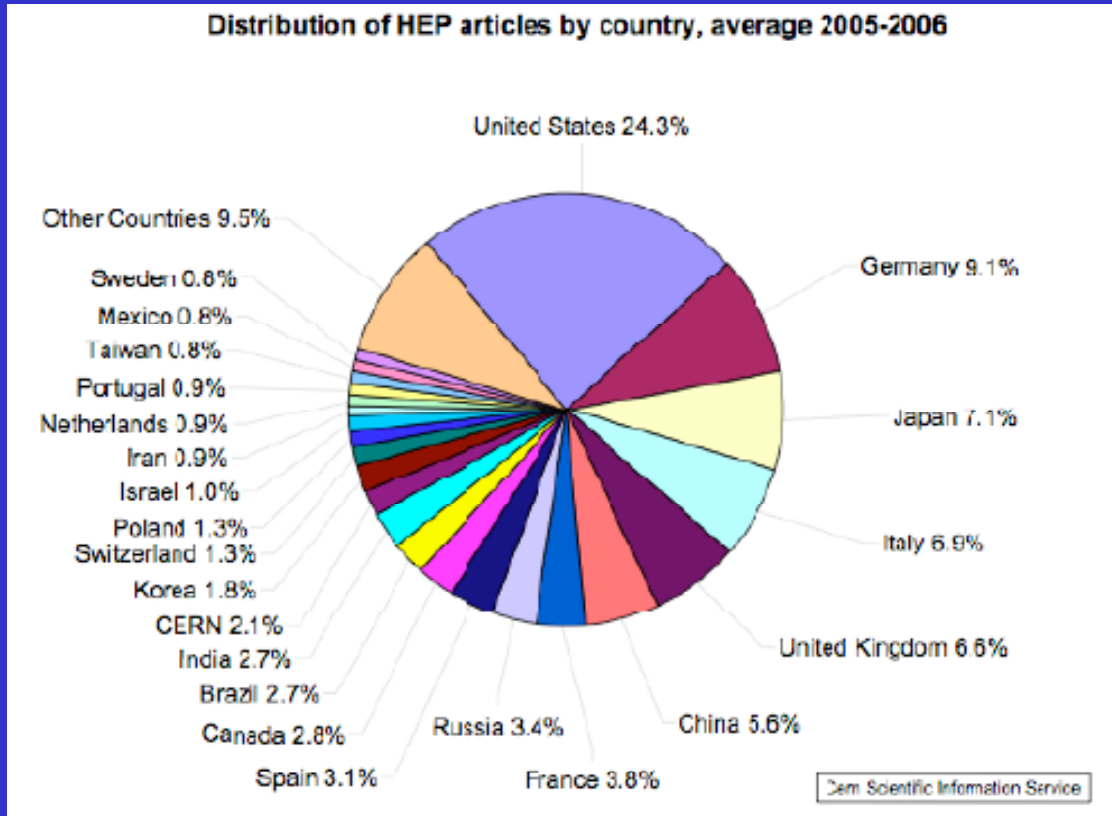
Experimental
Astro-Particle Physics

Experimental
Particle Physics

HEP Activity (FTEs)

Scientific Publications

(CERN SCOAP³ Study Group)

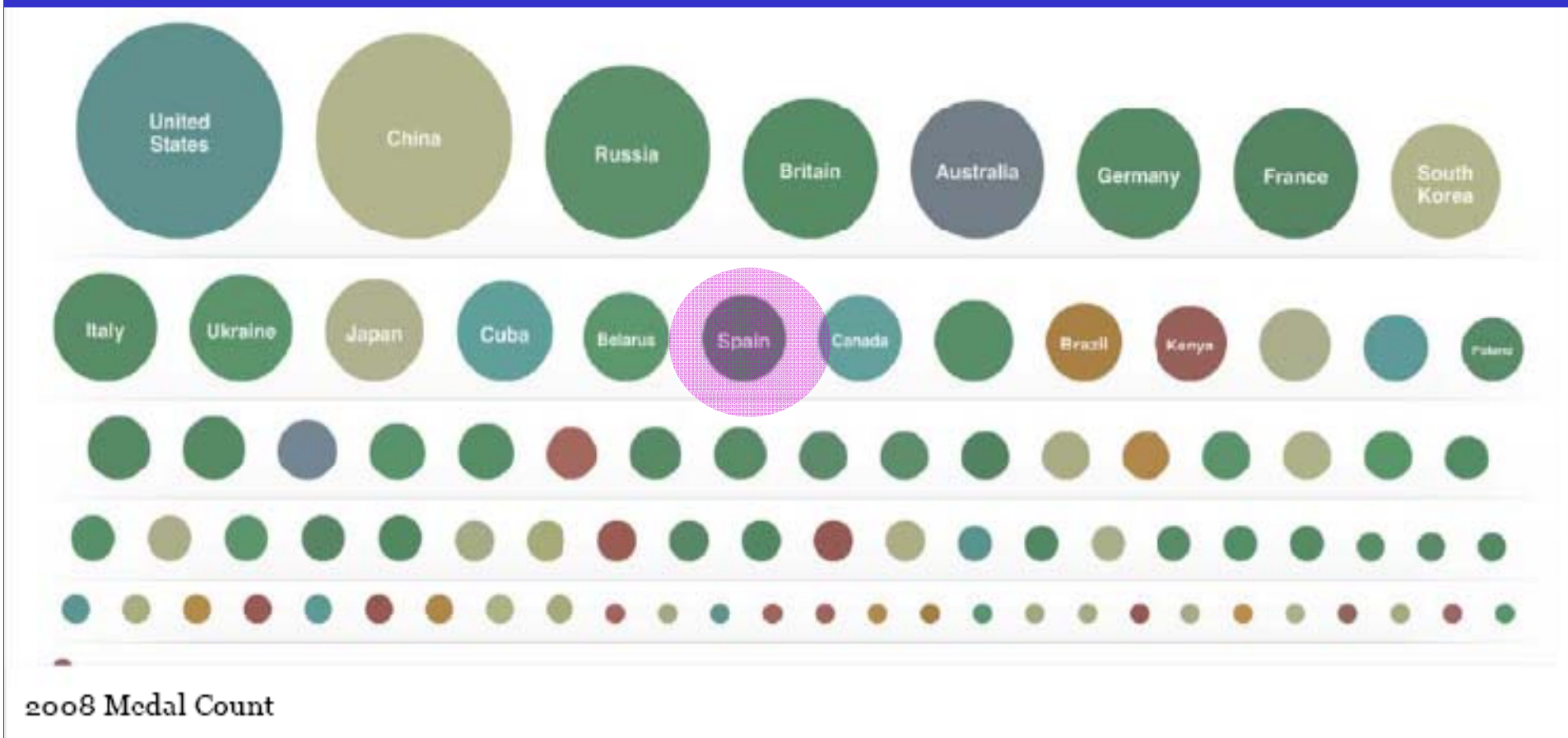


Spain needs to:
Increase the community?
(period with no running
CERN experiments)

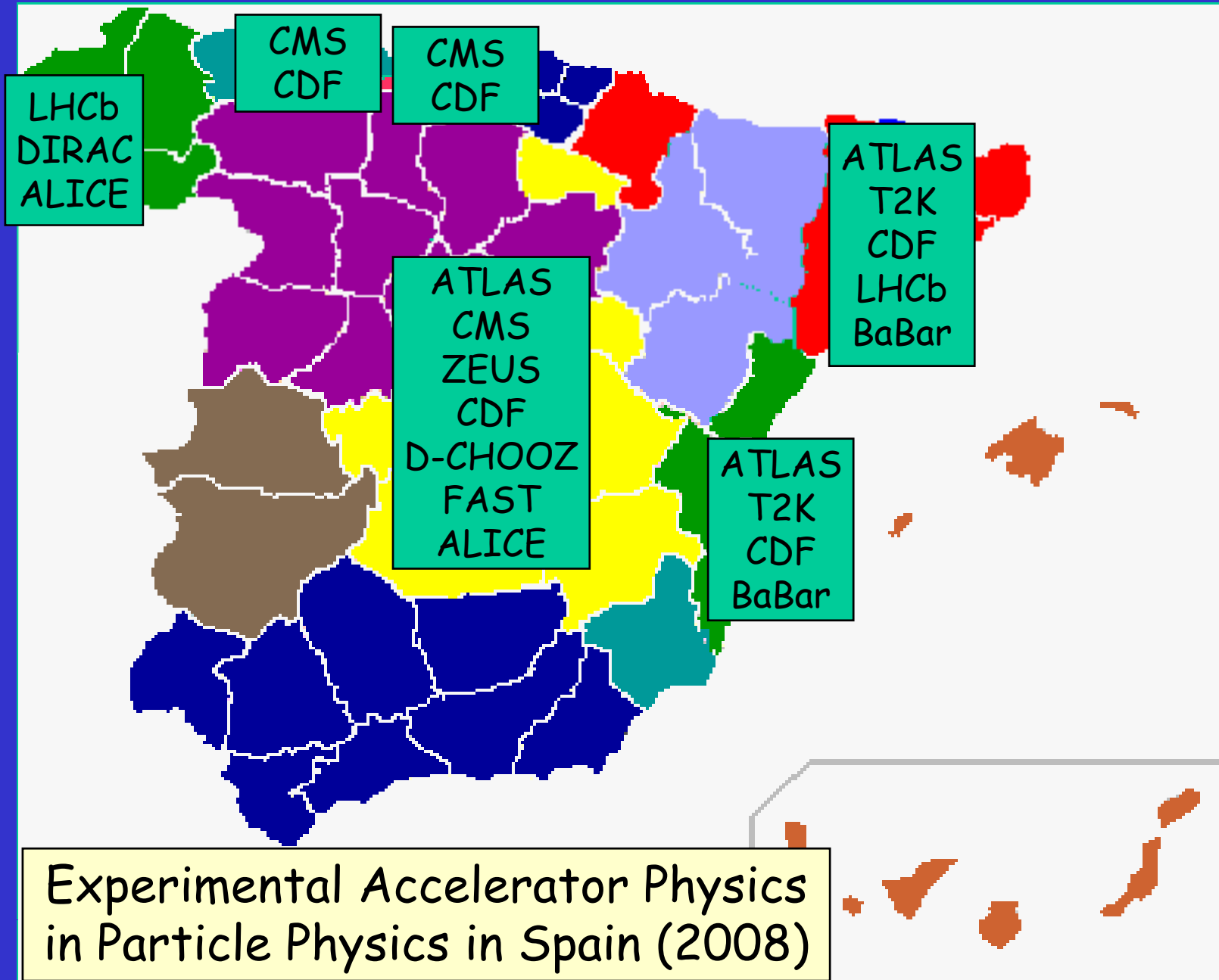
- N(authors)<10: Spain 3,2% (mainly theory)
- N(authors)>10: Spain 0,9% (mainly experiments)
- N(authors)>10 with at least One Spanish author: Spain 27%

Olympic Ranking

(The New York Times)



- In Beijing Olympic games, Spain: 2% of Medals, 14th in ranking
- In Particle Physics, Spain (2005-2006): 3,1% of publications, 9th in ranking



Spanish Participation in LHC



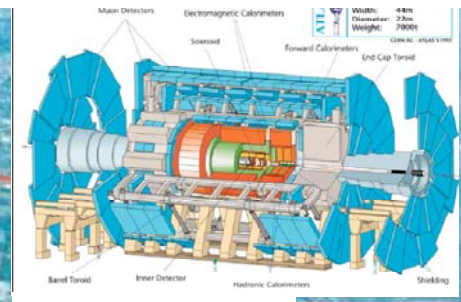
GRID:
Tier 1
3 Tier 2



Pp, B-physics, CPV
LHCb

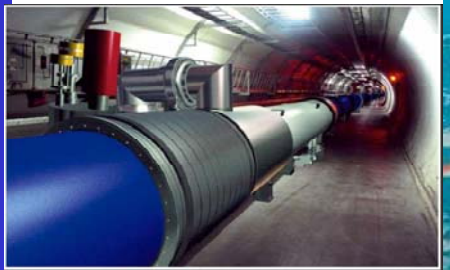
Spanish Contribution:
InTrk, ScintPaDet
Common Fund: A+B

Spanish Contribution:
SCT, Ecal-LAr, TiCal,
Common Fund: A+B



ATLAS/LHCf

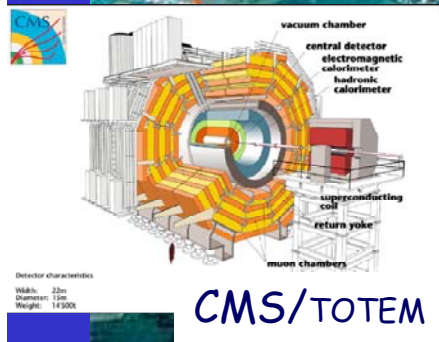
LHC : 27 km long
~100m underground



Spanish Contribution:
as CERN Member

General Purpose,
pp, heavy ions

Spanish Contribution:
 μ -system,
Common Fund: A+B



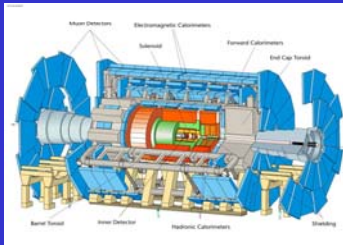
CMS/TOTEM

Heavy ions
ALICE

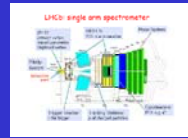
Spanish Contribution:
Computing,
Common Fund: A+B



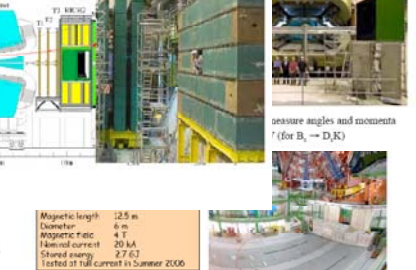
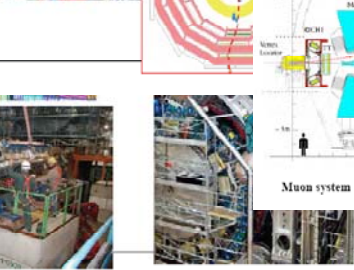
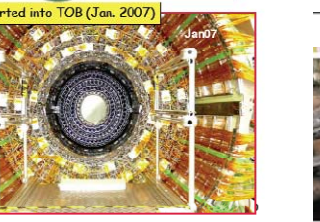
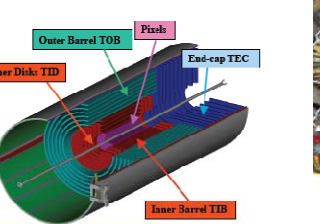
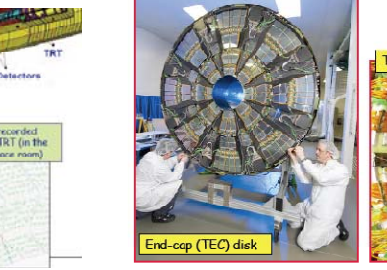
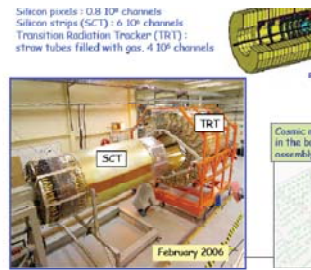
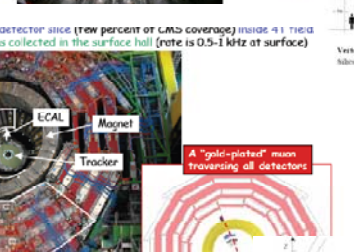
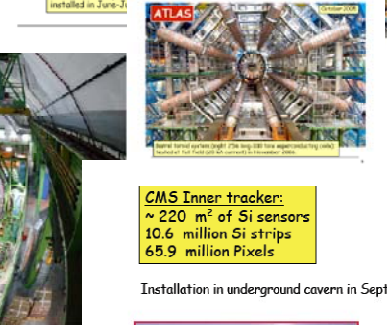
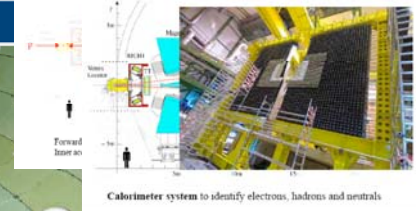
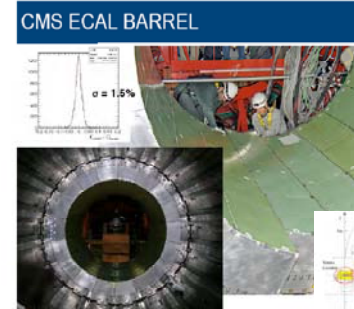
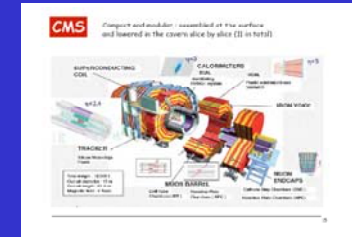
ATLAS+CMS+LHCb being completed...start... end of 2008

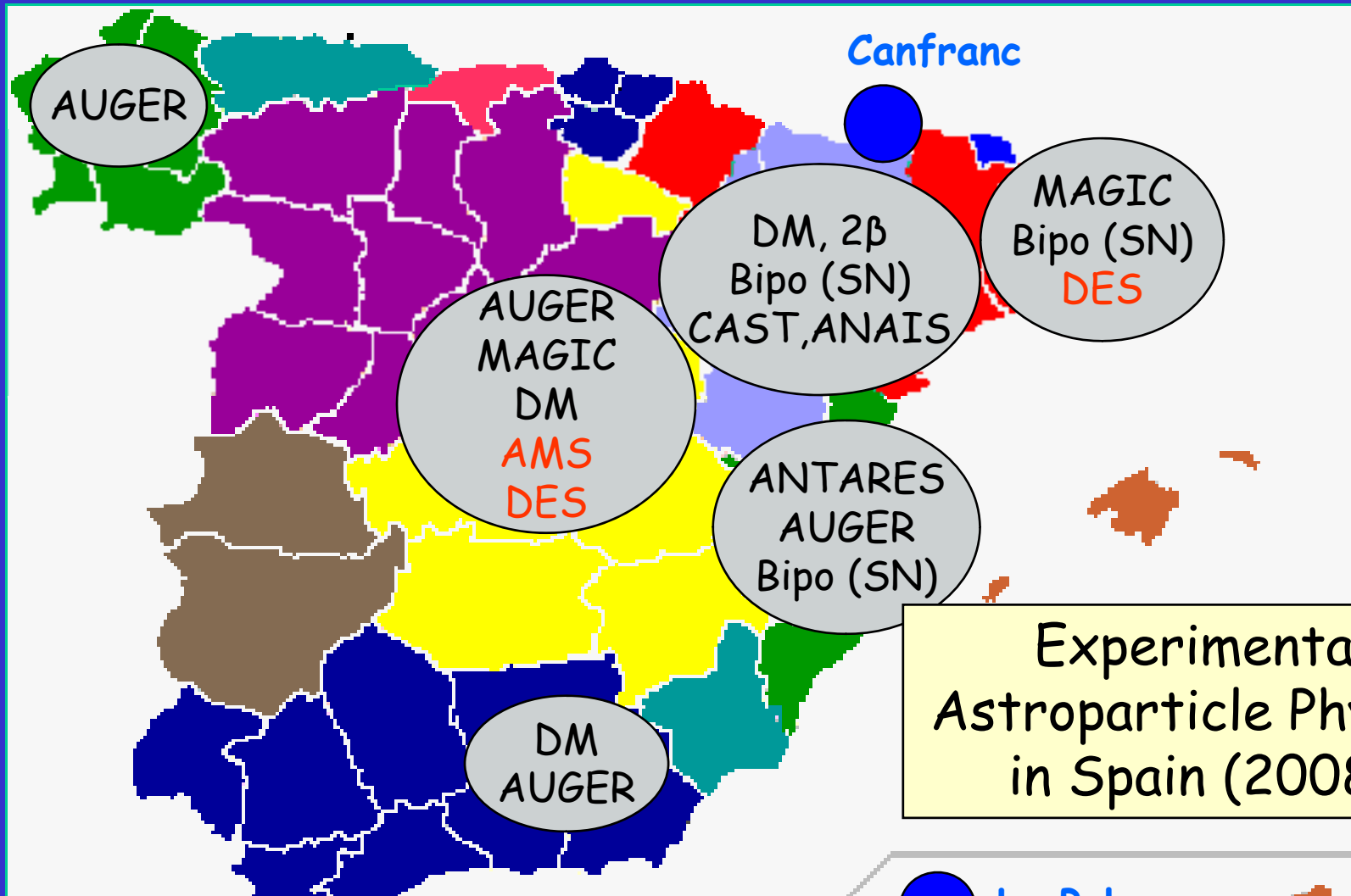


Spanish Contributions
 ATLAS 2,1%
 CMS 1,8%
 LHCb 2,7%
 ALICE 0,5%



Spanish Participation
 (including engineers ~1/3)
 ATLAS ~85/2500 3,4%
 CMS ~50/2000 2,5%
 LHCb ~33/690 4,8%
 ALICE ~9/1000 0,9%





Experimental
Astroparticle Physics
in Spain (2008)

- Experimental group(s)
- Scientific infrastructure



MAGIC

IFAE-Barcelona, UC-Madrid



- MAGIC (Roque de los Muchachos-2005) is a 17m diameter Cherenkov telescope aimed at the exploration of the 50 GeV - 10 TeV γ -ray band.

- MAGIC has successfully worked using all-aluminum mirrors, carbon fiber frame, active mirror control, optical analogue transmission and fast digitizers in Cherenkov telescopes.

- During its commissioning phase MAGIC has detected the Crab Nebula and the AGNs Mrk 421 and 1ES1959 at energies below 100 GeV. There is a preliminary confirmation of Sgr A at energies above 1 TeV.

- The collaboration has built a second telescope to operate in coincidence (2008).

- MAGIC & HESS prepare for the new generation: CTA (Cherenkov Telescope Array)



THE CANFRANC UNDERGROUND FACILITY

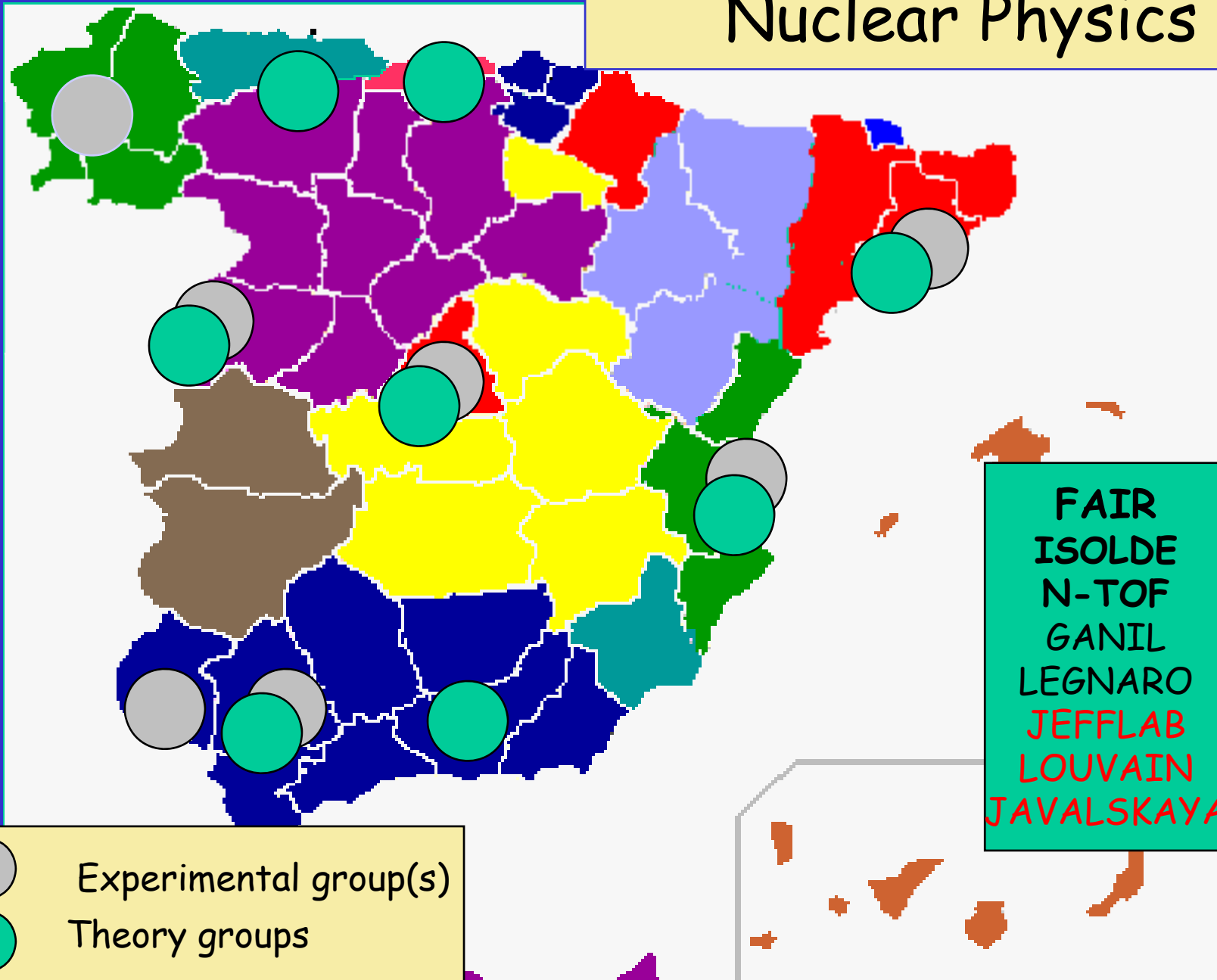
Description and location of the LSC

- The Canfranc Underground Laboratory is an underground scientific facility dedicated to experimental research in Astroparticle Physics since 1985.
- The LSC has been operated by the Research Group of the Zaragoza University up to 2006. Actually, after an important enlargement, it will be operated by a consortium: MEC, DGA and UZ.

The LSC is located under the Tobazo mount (1980 m. high) in the new Somport road tunnel, connecting Spain and France across the Central Pyrenees.



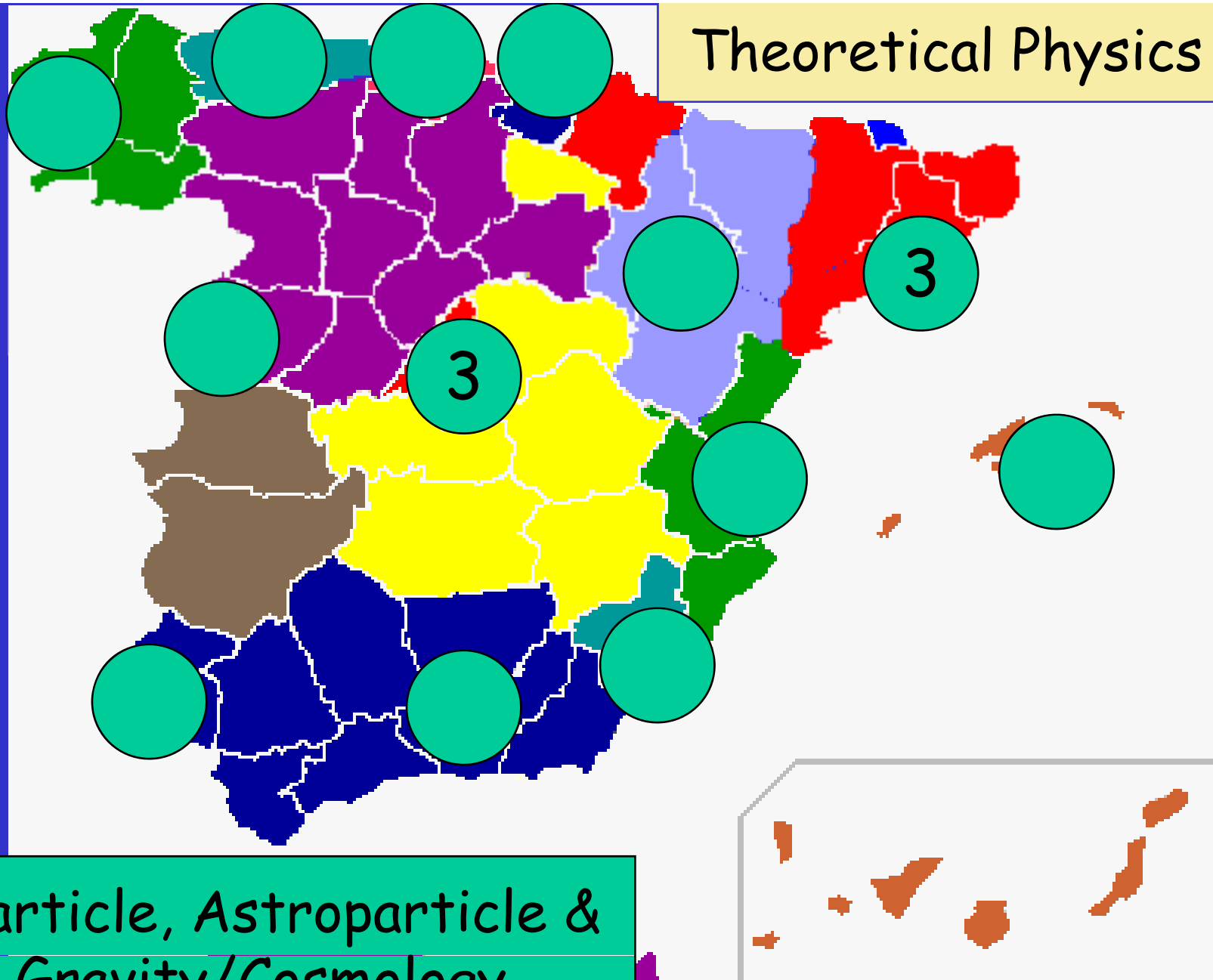
Nuclear Physics



● Experimental group(s)
● Theory groups

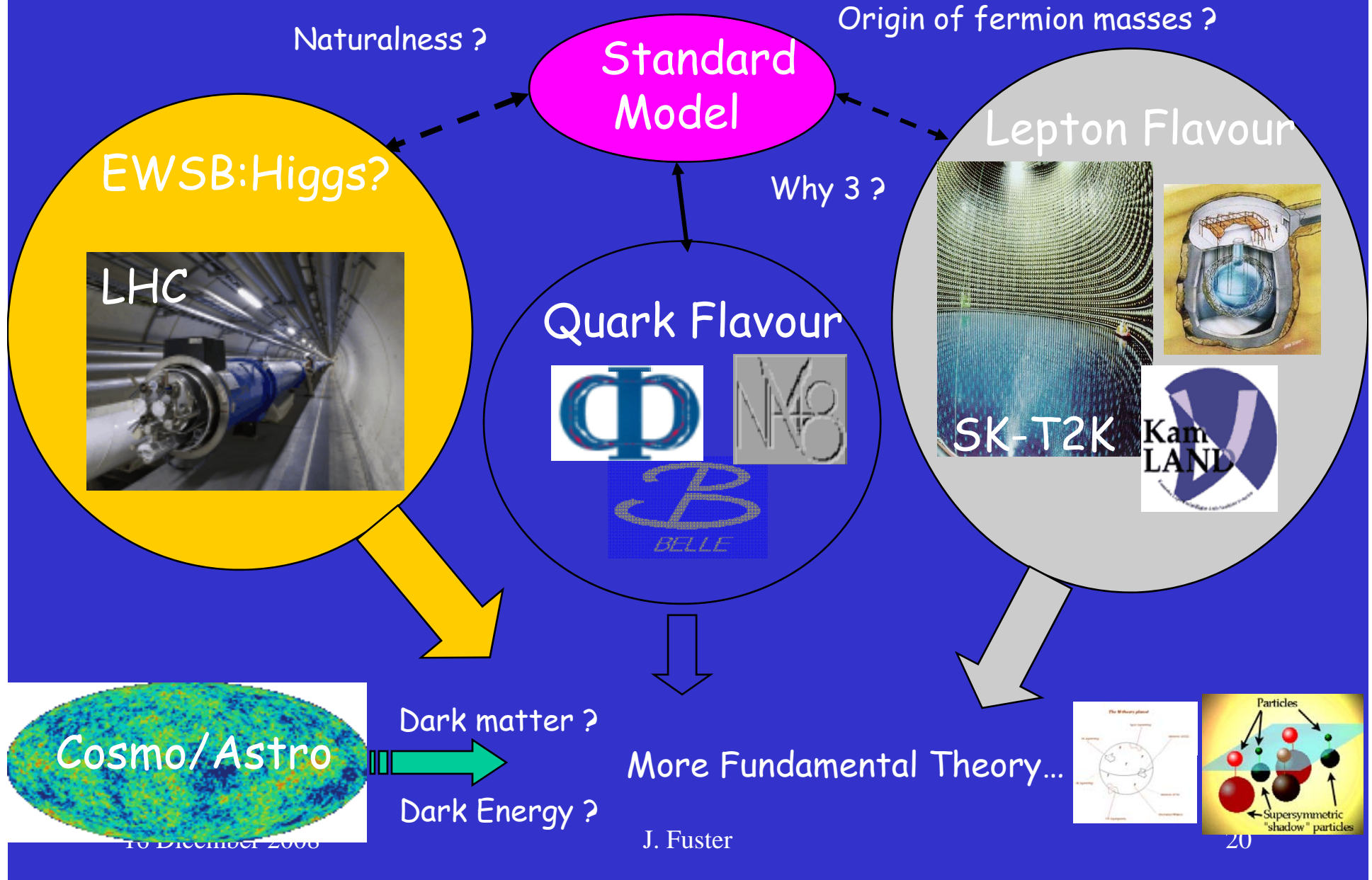
FAIR
ISOLDE
N-TOF
GANIL
LEGNARO
JEFFLAB
LOUVAIN
JAVALS KAYA

Theoretical Physics



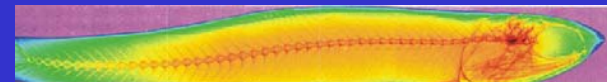
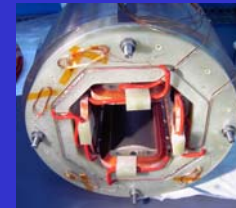
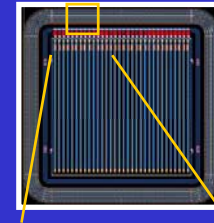
Particle, Astroparticle &
Gravity/Cosmology

The Standard Model is an extremely successful theory but still incomplete...



Technology, R&D, Outreach

- Computing
 - E-Science (GRID technology)
- Semiconductors:
 - Silicon detectors
 - Medical Imaging
 - Radiation Hardness
 - High density bonding
- Accelerators:
 - Magnets
 - Cryogeny
 - RF, Power Supplies
- Projects:
 - CLIC/CTF3
 - ILC, ATF2
 - SLHC, RD50
 - Dear Mama, CIMA



IFCA

