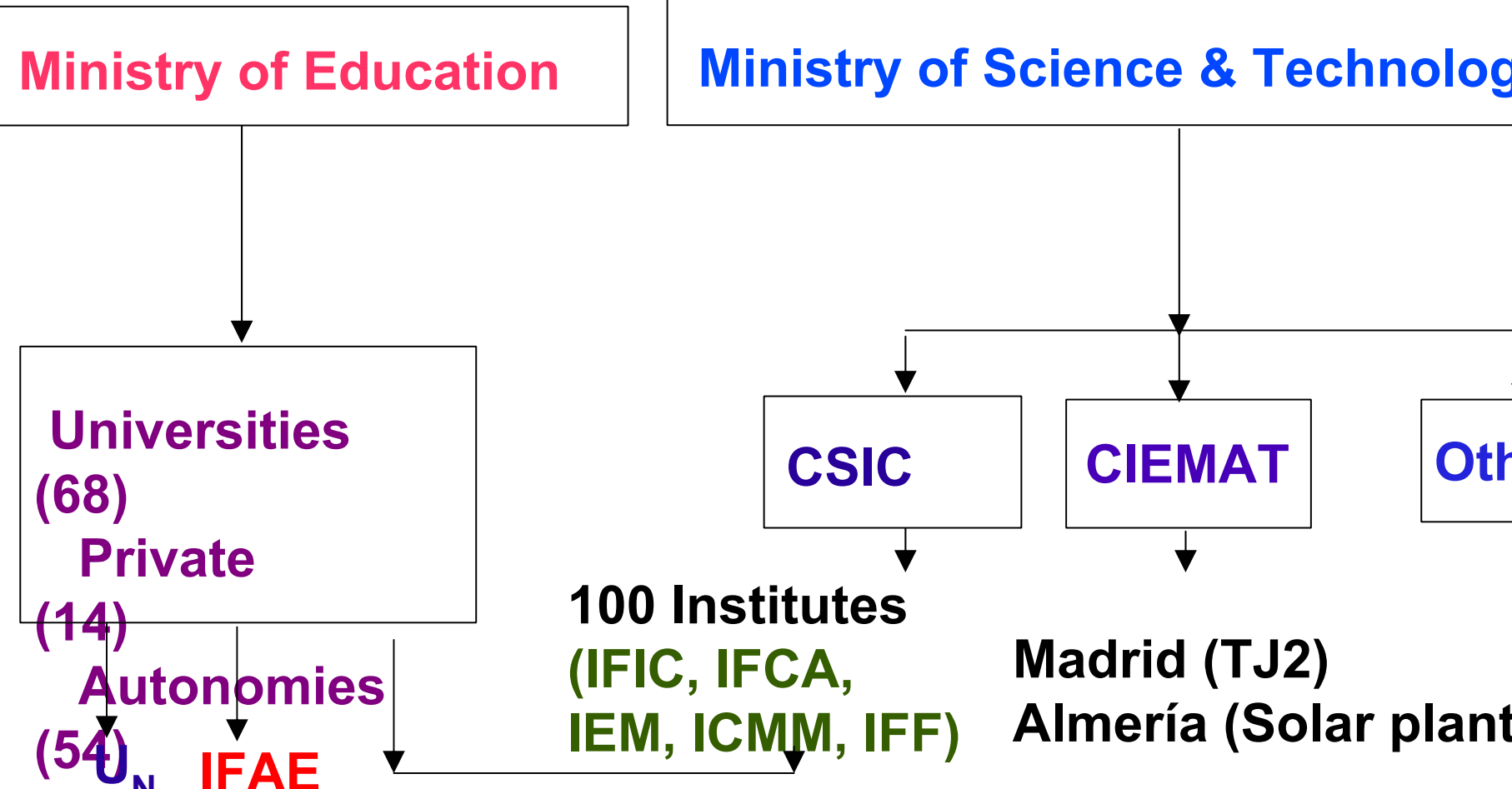


# Overview of HEP in Spain

**Antonio Ferrer** (IFIC -- Valencia University; CERN)  
**Chairman,**  
***Particle Physics & Large Accelerators***  
**National Program**

# Research Institutions in Spain



## 17 Research Programs

### ✍ 4 Basic Research:

General Knowledge

Astronomy & Astrophysics

*Particle Physics & Large Accelerators*

Thermonuclear Fusion

✍ **13 More oriented:** Biotechnology, Industrial Processes, T  
Material Sciences, Agriculture, Chemistry, Space, etc.

# Priorities of the National Program

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## Elementary Particle Physics (CERN).

✂ **Quarks & Leptons, Astroparticle, Neutrino, Hadrons,  
Theory**

## LHC Computing GRID technologies.

## Neutronics (N-TOF, ILL, ESS).

## Synchrotron Radiation (ESRF, LURE).

**Dark Matter, Dark Energy, Dark Universe**

# HEP Geographical (Spain)



# National Program *instruments*

 **Projects (3 year)**      **2 evaluation process: a) inter-**  
**pares**

**committee**      **b) experts**

**public presentation and defense (except**  
**theoretical)**

 **Special Actions**

 **Fellowship program (predoctoral) FPI, FPU, others**

# Activities in the National Program

Year **2001**

Year **2002**

Research Projects.. 26 (+30) ..... 30  
(+40)

Special Actions... 16 ..... 12

Fellowship Program.. 9 ..... 16

## Bilateral Cooperation

..... IN2P3..... 19 ..... 17

..... INFN..... 18 ..... 19

# HEP human resources

(1999)

a) **14 Experimental groups** .... **220** Ph+Tech.  
**7** Visitors.

(3 large groups: CIEMAT, Madrid;  
IFAE, Barcelona;  
IFIC, Valencia)

b) **10 Theoretical groups** .... **200** Phys.

(4 large groups: Valencia, Barcelona, Zaragoza,  
Madrid)



# HEP human resources

## 2. Theoretical

## # Physicists.

IFIC (Valencia)	42	
IFAE (UB)	28	
UZ (Zaragoza)	26	
UAM (Madrid)	23	
UCM (Madrid)	19	
CSIC (Madrid)	17	
IFAE (UAB)	16	
USC (Santiago)		14
UGR(Granada) *	8	
UPV(País Vasco) *	5	
UC (Córdoba)*	1	

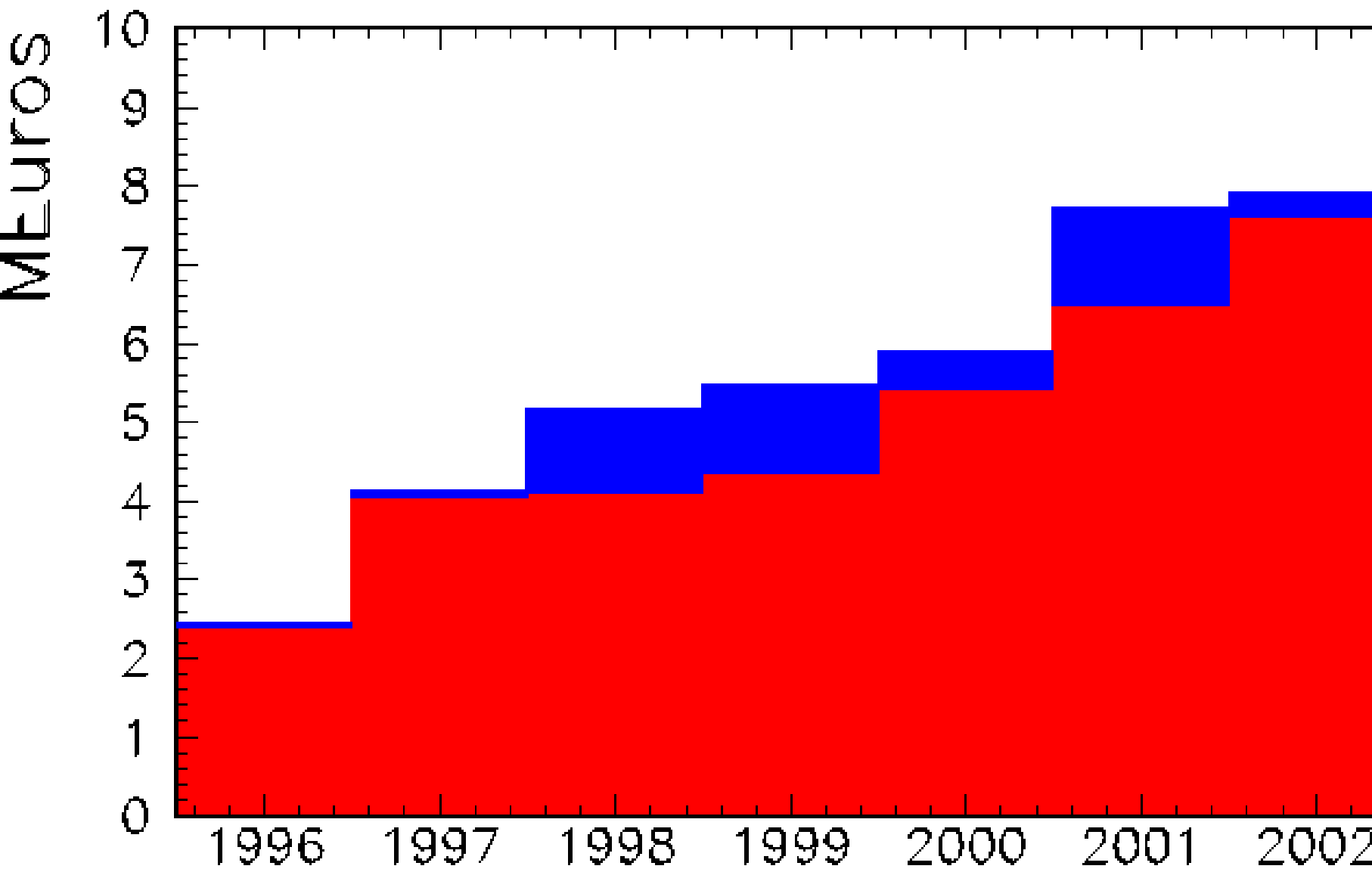
# Human Resources

## Personnel by status

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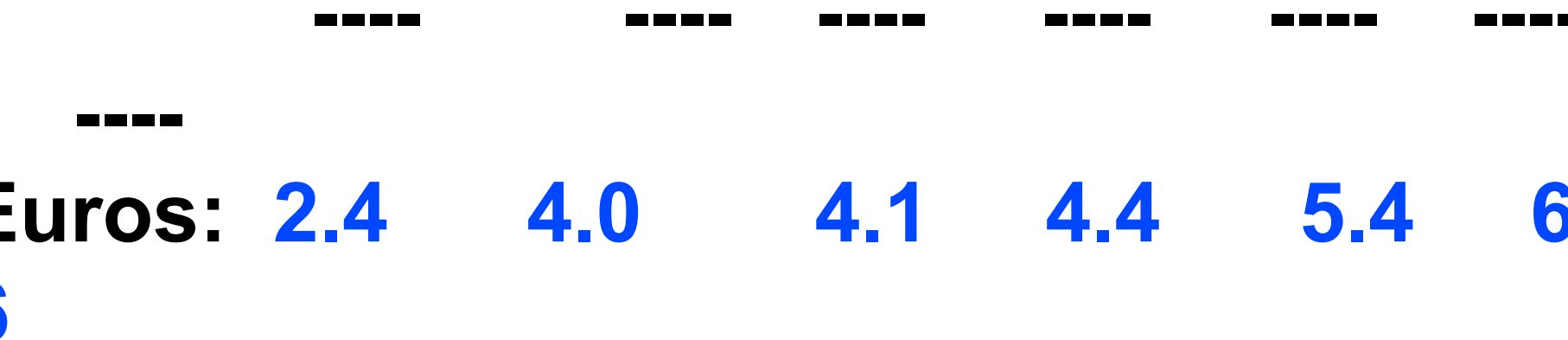
	(1999)	(2002)		
Experimental	(200)	(270)	Staff	42%
			Fellows	29%
			Contracts	17% (4% RyC)
			Technical	12%
Theoretical	(190)	(220)	Staff	41%
			Fellows	36%
			Contracts	22% (12% RyC)
PhD's (exp) outside Spain:		24	( 11% of total exp.)	
		11	got Ramón y Cajal contract	

# HEP National Funding



# HEP National Funding (Spain)

Year: 1996; 1997; 1998; 1999; 2000; 2001; 2002



Comments:

increase due to LHC participation

# HEP Program

(Spain, 2002)

**Theory**

%

**LHC**

(ATLAS, CMS, LHC-b)

48

**LHC-GRID**

18

**HERA**

(Zeus)

1

**PS+ISOLDE**

(Dirac, +Legnaro, Ganil)

5

**Astroparticle**

(Auger, Canfranc, Magic, Antares, AMS)

11

**Neutronics...**

(N-Tof, Ions, Spallation)

2

**Synch Rad**

(ESRF)

4

# HEP Program: # Projects

( 2001)

(2002)

Theory	14	(4+5+5)	15
LHC+GRID	9	(1+5+3)	20
LEP & HERA	5		2
ASTROPARTICLES	12	(6+5+1)	12
ISOLDE&ions	5	(0+3+2)	7
Neutronics	9	(6+3)	9
Sync. Rad.	2		2
R&D	-		3
	-----		----
	56		70

# HEP Groups & projects

## Experimental

CIEMAT (Madrid)	CMS	+G	AMS	L3	
IFIC (Valencia) hep	ATLAS	+G	ANTARES	DELPHI	HARP
IFAE (Barcelona)	ATLAS	+G	MAGIC	ALEPH	
Neutrino					
UAB (Barcelona)			MAGIC		
UB (Barcelona)	LHCb	+G		HERA-b	
ICMB (Barcelona)	ATLAS				
UAM (Madrid)	ATLAS	+G		ZEUS (DESY)	
UCM (Madrid)			MAGIC	HEGRA	
IFCA (Santander)	CMS	+G	CDF (FNAL)	DELPH	
USC (Santiago)	LHCb	+G	DIRAC	HADES	N-TO
USC (Santiago)			Auger		
IFPFN (Zaragoza)			CAST	LSC (Canfranc)	
UGR (Granada)			ICARUS		
IFIC (Valencia) nuc	GSI	ISOLDE-GANIL	HADES	N-TO	
IFEM (CSIC Madrid) nuc	ISOLDE-GANIL		III		

## 1985-2000

### 1. ALEPH

(19 PhD)

IFAE- Barcelona  
&

Luminosity Monitor (BCAL, BCAL  
FALCON)

### 2. DELPHI

(28 PhD)

IFIC- Valencia  
IFCA - Santander  
UCM

TOF (100% ) & FEMC (20%)

### 3. L3

(17 PhD)

CIEMAT

Muon Chambers (100% Z, 2/3 P)

64 Ph D. about 1000 papers



# Spain & LHC

	<b>ATLAS</b>	<b>Core</b>	<b>Fund</b>	
<b>SCT (IFIC)</b>		<b>1.2</b>		
TiCal (IFAE+IFIC)		2.1		
Lar (UAM)		2.4		
	-----	---	---	
Total		5.7	4.1	<b>9.8 MFS</b>

0%)

	<b>CMS</b>	<b>Core</b>	<b>Fund</b>	
Muon (CIEMAT)		3.0		
Align (IFCA)		1.2		
	-----	---	---	
Total		4.2	1.8	<b>6.0 MFS</b>

0%)

	<b>LHCb</b>	<b>Core</b>	<b>Fund</b>	
Calo (UAB)		0.63		

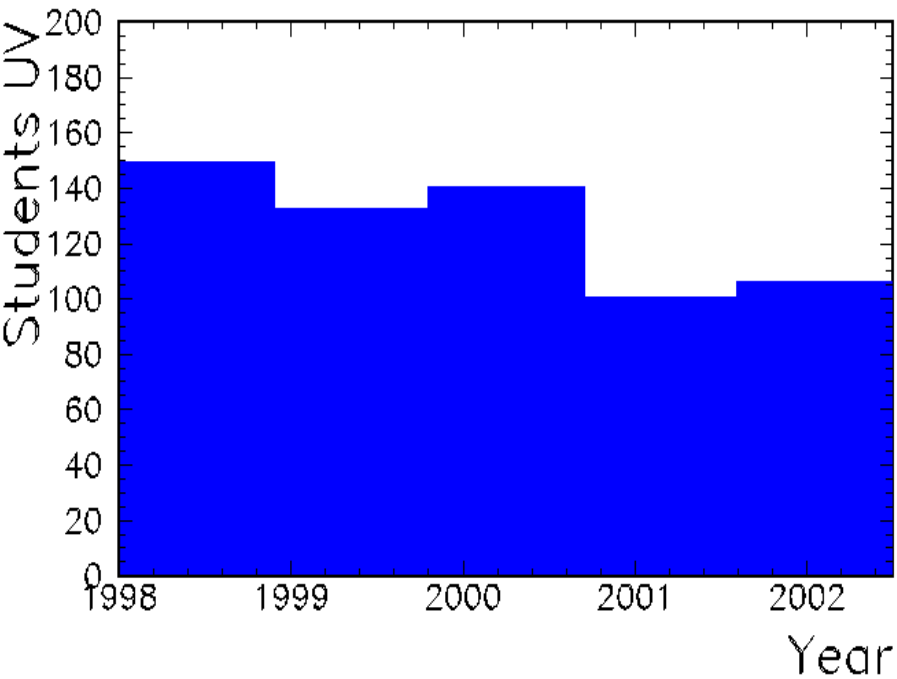
# Spain HEP & CERN

Spain's CERN budget	7.0%	Staff:	85	( 3.3 %)	
Excellent Fellows candidates:			29	(13.4 %);	low E high T
Paid Associates			22	( 7.5 %)	
Students			25	(15.8 %)	
-----					
Unpaid Associates			181	( 3 %)	
-----					

reasonable industrial return (since 1998, about 100%).

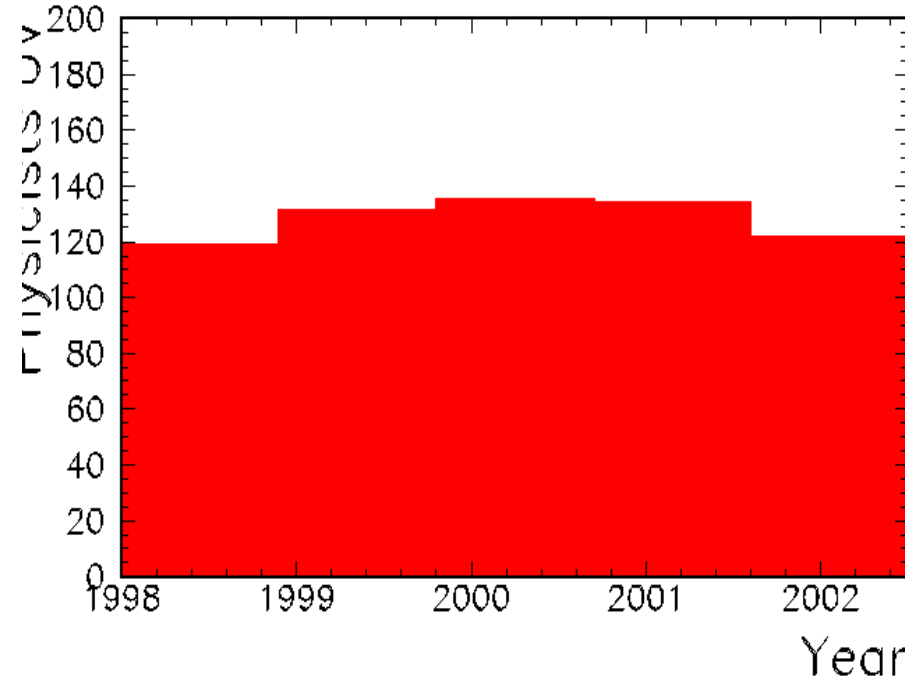
Special contributions:	LEP2000	1.5 MCHF	
	CNGS	4 MCHF	
	LHCG	0.7 MCHF	
			+5 men-year during phase

# Physics students (Univ. Valencia)



Admitted 1<sup>st</sup> year.

40% decrease in the last 5 years



Getting License in Physics.

Almost constant.

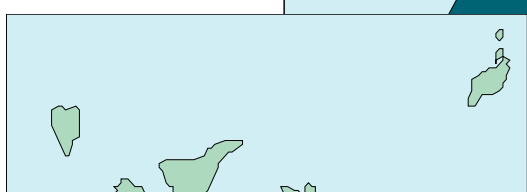
# Accelerator projects in Spain

Laboratori Llum  
otró

Centro de Análisis de  
riales  
(JAM)

Centro Nacional de  
eradores  
(ISE-CSIC)

ro de Tecnologías de  
eradores  
(JV)



# Future perspectives

📁 HEP will continue to be a National Program in the next 4 years Plan (2004-2007).

📁 We plan to continue the growth of personnel & budget (increase scientific & technological returns from CERN).

📁 Increase the number of technical personnel.

📁 Spanish CERN staff, should continue to grow.

📁 Continue special Spanish trainees program at CERN. Benefits for GRID deployment in Spain and technologies development.

📁 Participate in other international projects (DESY, FNAL, SLAC) and soon LC.