

Gaspar , CERN

Tecnology and people

Paulo.Gomes@cern.ch (CERN Management Liaison for Pt)



Historical Intro

I had the chance to participate in the first workshops Gaspar organized on microprocessors (1985) and fast electronics (1987) for Particle Physics setting the basis for LIP's branch on electronics and instrumentation

He was my supervisor for 10 years, since the end of my Degree (85) until completing the PhD (95)
He always trusted and supported my work, and was a source of great inspiration for me

1986 was the year of Portugal joining CERN and of LIP creation

During the unforgettable summer of 86,

we developed and implemented the first electronics card by LIP for CERN based in an electronics lab that Gaspar had created near Trieste (ICTP) in full immersion, working, eating and sleeping on location

it was called FARCE (Fast Acquisition and Crate Encoder), but worked very well in NA38

Next, we participated in the development of the first optical link for DELPHI and ALEPH (87-89)

After my thesis (90-95), co-supervised by Gaspar,

I moved to CERN, to work on cryogenics controls and then on vacuum controls

Since 2013-15, I re-established closer contact with Gaspar,

while he was the Delegate to CERN Council

and coordinator of the FCT program for Trainees at CERN

CERN funded in 1954 by 12 European states
Currently 23 members
Portugal joined in Jan 1986



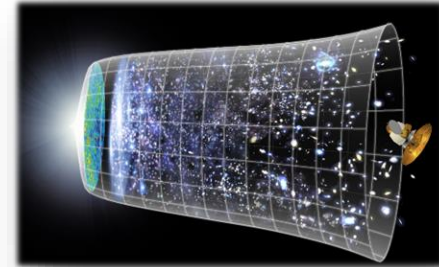
~ 2 600 staff
~ 1 800 fellows, associates
~ 14 000 external users
~1 200 MCHF budget



Mission of CERN

Recall the 4 points of CERN's mission,

Gaspar contributed to all of them during his rich scientific life



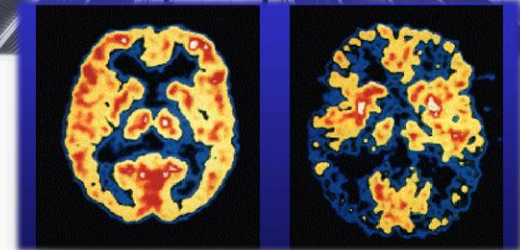
1. Push back the **frontiers** of knowledge

os segredos do Big-Bang ...

como era a matéria durante os primeiros momentos do Universo?

para onde foi a anti-matéria?

onde estão a matéria e energia escuras?



2. Develop new **technologies**

for accelerators and detectors

Tecnologias de Informação – a Web e a GRID

Medicina – aceleradores e detectores para diagnóstico e terapia

Energia - Painéis solares com ultra-vácuo

3. Train scientists & engineers of tomorrow

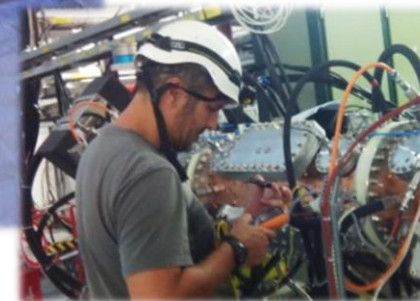
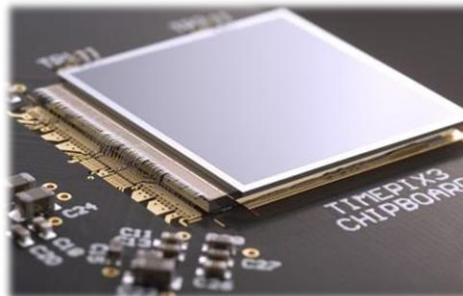
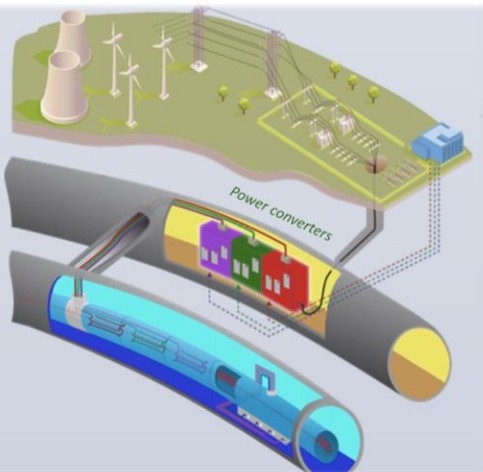


4. Promote science for **peace**

Unir pessoas, países e culturas

Technology at CERN

- Electronics
- Computing / IT
- Cryogenics & Vacuum
- Control Systems
- Electricity
- Magnets
- Robotics
- RadioFrequency
- Mechanics
- Material Science



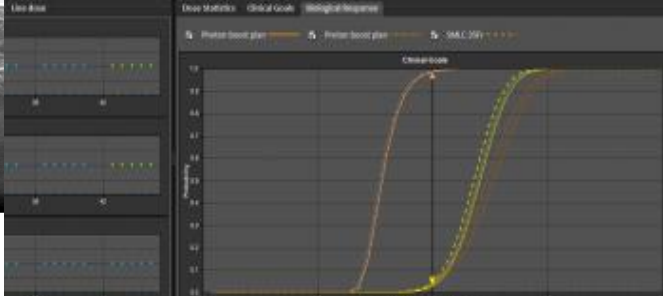
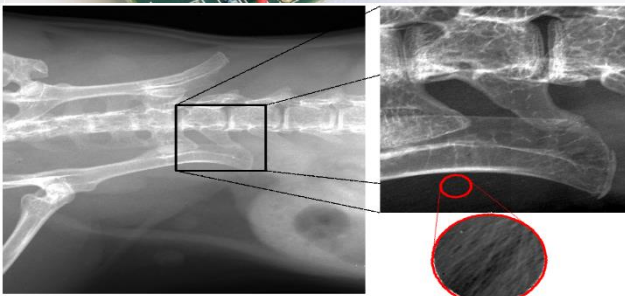
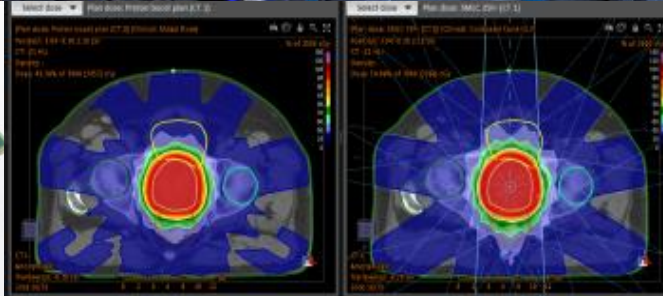
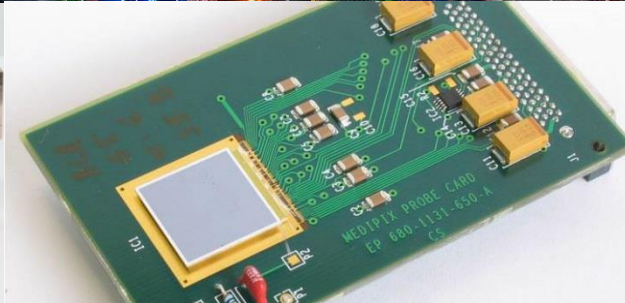
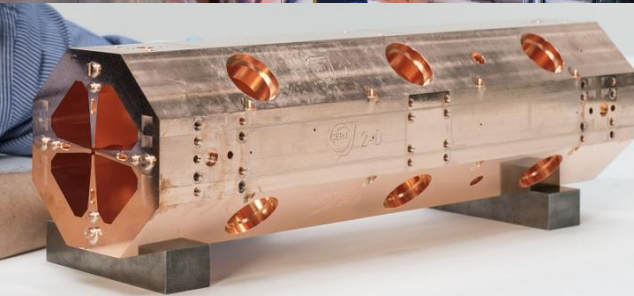
Gaspar, LIP, Portugal

participate in the 3 main technological domains of CERN

Accelerators

Detectors

Computing



Medical Applications derived from them

<http://kt.cern/medtech>

Acceleradores for proton therapy

Detectors for imaging & diagnostics

Computing for Therapy simulations

Portuguese Industry



Portuguese Industry at CERN (FCT 2014)

PORTUGAL IN LARGE-SCALE RESEARCH FACILITIES

CERN

ESO

ESRF

ITER

ORGANIZATIONS SUPPLIED BY THE COMPANY

CERN

- ▼ A. Silva Matos
- ▼ Active Space
- ▼ Cudell
- ▼ Cunhol
- ▼ Efacec
- ▼ Glintt
- ▼ Incomef
- ▼ ISQ
- ▼ NCP Metal
- ▼ Siroco
- ▼ Solidal

ESO

- ▼ A Silva Matos
- ▼ Active Space
- ▼ Critical Software
- ▼ Exatronic
- ▼ ISQ
- ▼ Solidal

ESRF

- ▼ Efacec
- ▼ Glintt

ITER

- ▼ A Silva Matos
- ▼ Active Space
- ▼ Fiber Sensing
- ▼ ISQ

TECHNOLOGY DOMAIN

SOFTWARE

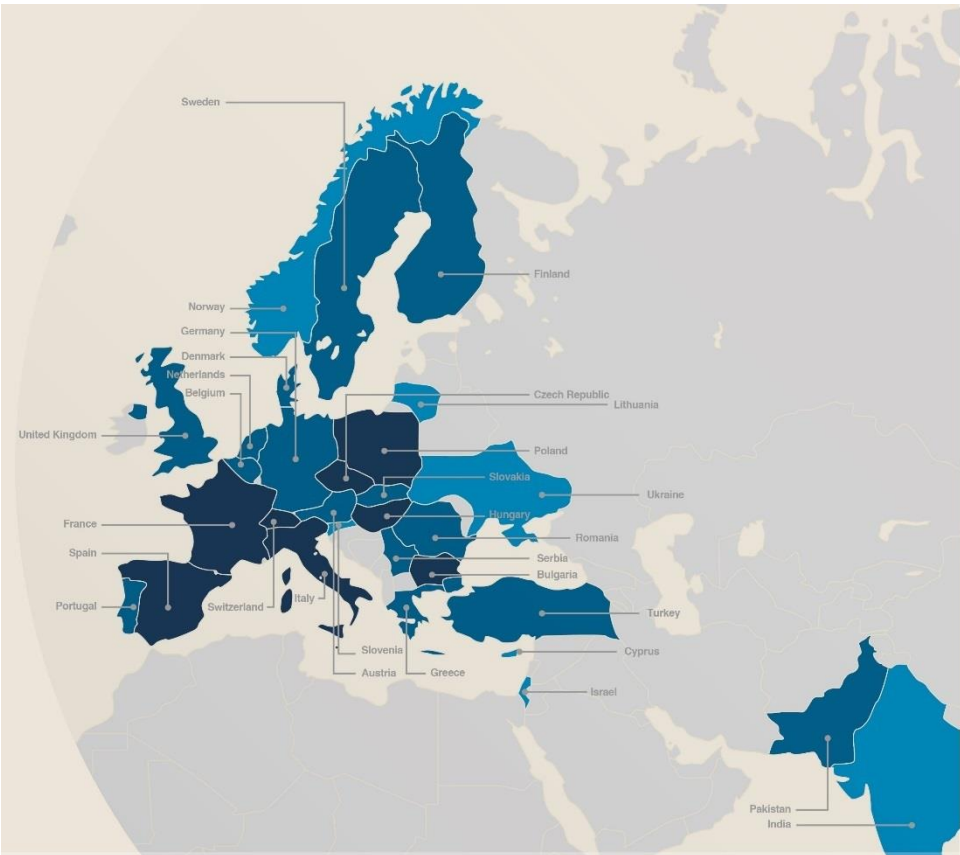
- ▼ Critical Software
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- ▼ Incomef

HARDWARE

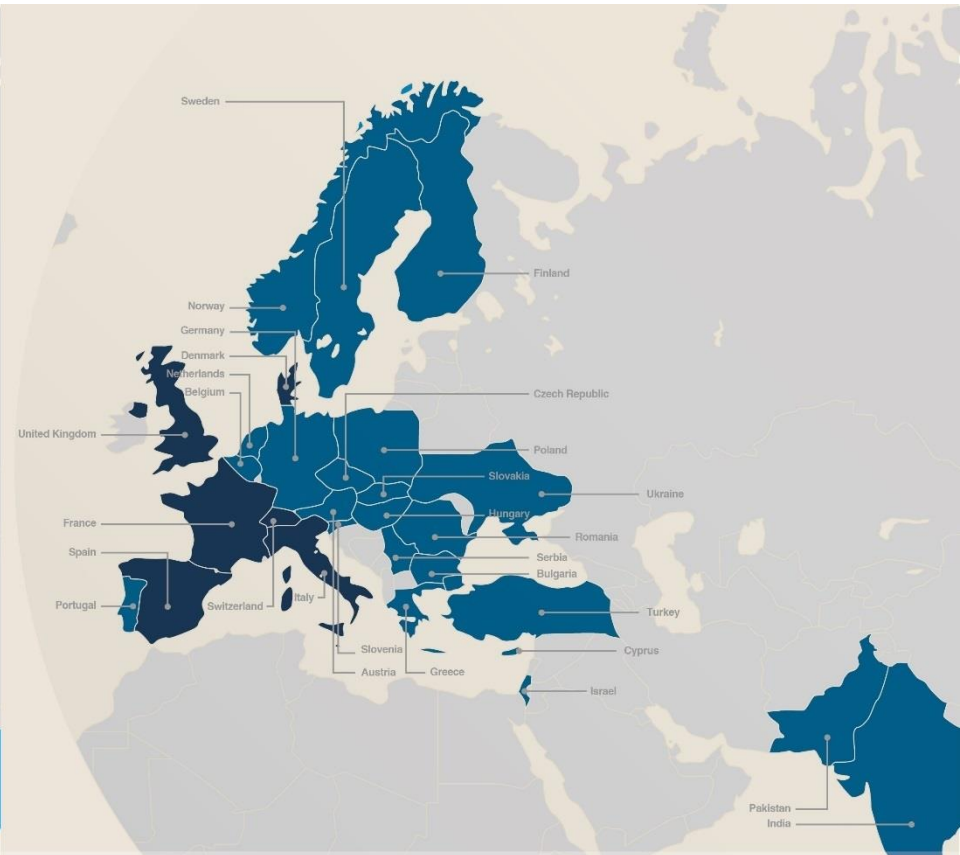
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folheto FCT - catálogo tecnologia Pt

well / poorly balanced states (2018)



Supplies 2014-2017



Industrial Services 2014-2017



Contributions of Member States (2018)

Country	%	In CHF, 2018 prices
Austria	2.14546	24 091 850
Belgium	2.70652	30 392 150
Bulgaria	0.29270	3 286 800
Czech Republic	0.93289	10 475 650
Denmark	1.80239	20 239 450
Finland	1.33102	14 946 350
France	14.11914	158 547 200
Germany	20.54959	230 756 250
Greece	1.11916	12 567 300
Hungary	0.61163	6 868 150
Israel	1.61448	18 129 350
Italy	10.42866	117 105 900
Netherlands	4.60862	51 751 300
Norway	2.71026	30 434 150
Poland	2.81891	31 654 200
Portugal	1.10135	12 367 300
Romania	1.02257	11 482 650
Slovakia	0.48819	5 482 000
Spain	7.04175	79 073 450
Sweden	2.68934	30 199 200
Switzerland	4.02461	45 193 300
United Kingdom	15.84076	177 879 750
Total	100%	1 122 923 700

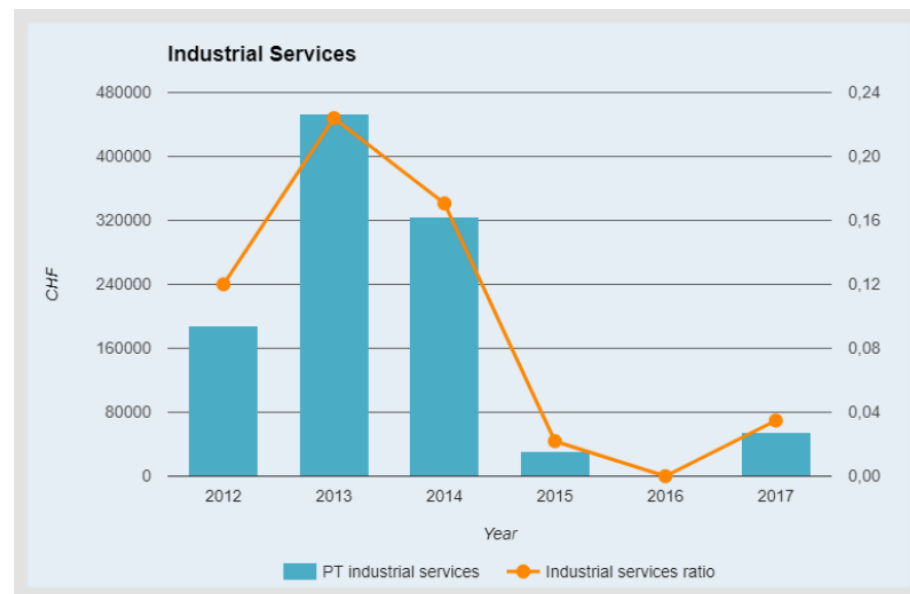
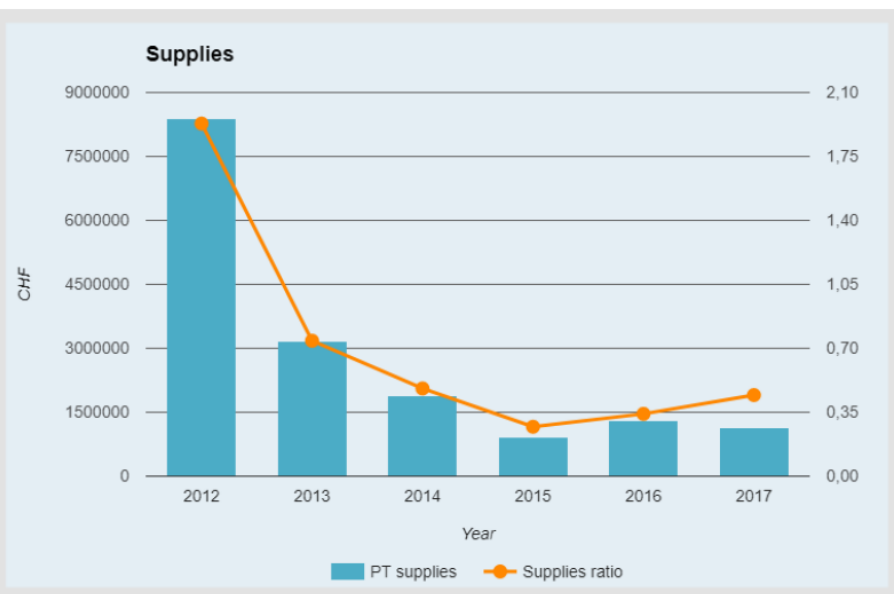
PT – industrial return (2017)

	CERN Budget		
	Total Contribution	Contribution PT	
	I	II	III = II/I
	CHF	CHF	%
2012	1,091,804,300	13,492,750	1.24%
2013	1,092,816,950	13,289,900	1.22%
2014	1,103,322,899	13,205,900	1.2%
2015	1,062,202,700	12,009,800	1.13%
2016	1,127,444,450	12,680,500	1.12%
2017	1,142,179,450	12,473,650	1.09%

Expenditure for All Countries	
Supplies	Industrial Services
IV	V
CHF	CHF
352,236,775	130,558,377
351,567,741	166,390,502
329,242,703	159,408,925
297,504,934	126,378,183
342,576,843	146,917,979
232,086,828	142,731,742

Expenditure by Country of Origin PT	
Supplies	Industrial Services
VI	VII
CHF	CHF
8,388,473	187,945
3,169,248	453,185
1,881,795	324,017
909,663	31,243
1,312,735	-
1,125,686	54,200

Industrial Return Ratios PT	
Supplies	Industrial Services
VIII = (VI/IV) / III	IX = (VII/V) / III
CHF	CHF
1.93 (0.89)	.12 (0.4)
.74 (0.91)	.22 (0.4)
.48 (0.91)	.17 (0.4)
.27 (0.9)	.02 (0.4)
.34 (0.9)	0 (0.4)
.44 (1)	.03 (0.4)



2ND HILUMI INDUSTRY DAY

INSTITUTO SUPERIOR TÉCNICO (IST)
31 October 2016
LISBON



AN EVENT FOR COMPANIES WILLING TO TAKE ON THE HL-LHC TECHNICAL CHALLENGES
More information on HL-LHC and future procurement needs
<https://project-hl-lhc-industry.web.cern.ch>

As an Intergovernmental Organization, CERN is not a legal entity under national law but governed by public international law.

CERN benefits from immunity from national jurisdiction and execution. Thus, legal disputes between CERN and its suppliers and contractors are not submitted to national courts but solved via international arbitration.

CERN is thus entitled to establish its own internal rules necessary for its proper functioning, such as the rules under which it purchases equipment and services.

Procure all supplies and services, meeting all requirements, at lowest possible overall cost, while achieving balanced industrial return for the Member States

Results of contracts with CERN

- 38% had developed new products
- 42% increased international exposure
- 44% improved technological learning
- 52% would have had poorer sales performance without CERN
- 17% opened a new market
- 60% acquired new customers
- all firms had derived great value from CERN as a marketing reference



What do we buy? Recurrent supplies and services



- **Civil engineering**
Buildings, roadworks
- **Utilities**
Cooling & ventilation
Power distribution, cables, overhead cranes
- **Infrastructure & services**
Metal structures
Mechanical engineering
Radiation shielding
Transport & handling
Safety & access control
- **Installation, operation & maintenance**
- **Data acquisition, computing & networking**
- **Various supplies**
Furniture, tooling, gases, etc.

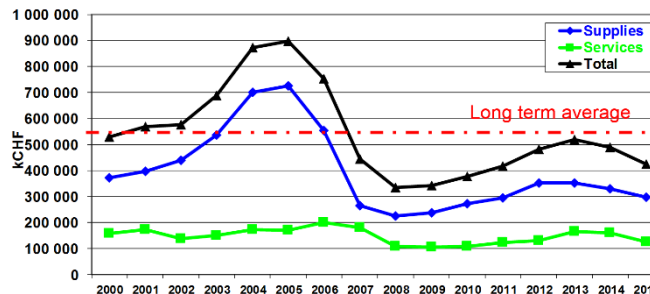


What do we buy? Accelerator technologies required for consolidation projects and new developments

- Industrial controls & field buses
- Timing & "fast" real-time controls
- Beam collimation
- Beam injection, ejection & dump
- Radio-frequency equipment
- Power converters
- Beam instrumentation & diagnostics
- Permanent and electro-magnets
- Cryogenic equipment
- Vacuum equipment

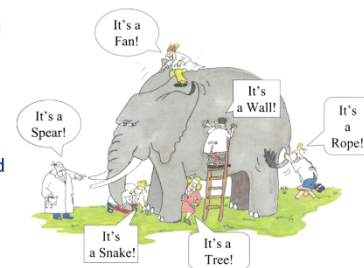


Procurement Expenditures 2000-2015



What do we buy? Standard or Non-Standard?

- Off-the-shelf or non-standard products which can be produced with existing manufacturing techniques and/or technologies => functional specification
- Non-standard products where industry has neither the required know-how nor the immediate interest to develop and design the products for its existing markets => built to print
- Prototypes and/or pre-series needed?



HILUMI shopping list
CERN shopping list
procurement info



To be a successful CERN supplier

Courtesy of [Emir Sirage](#)
(former PT ILO)

3 issues a company must truly consider :

Allocate the best qualified human resources to start discussions with CERN
(with proven technical experience and qualifications)


Be ready to invest (time and money) before any commercial supply/service contract is won with CERN

Understand that CERN is not a typical market, but
A reference that represents Uniqueness, Challenge and Elevated Quality

Successful stories

Example 1 – Multinational

ENERGY SECTOR



efacec
www.efacec.com



Network Management
Network Optimization, Energy Management and Operations Management (Forecasting, Short circuit analysis)

SCADA System Operation
Control and Supervision of Electrical Substation information; Alarms and alerts received in real-time for situational awareness and decision support; Historic Data archiving and Reporting support.

Field Automation
Protocol translation to IEC60870-5-104 from different third party IEDs using multiple communication protocols, high reliability, local archiving and local human machine Interface, Clock Synchronization.

Power Supplies
Auxiliary power supplies for the LHC (Large Hadron Collider) particle accelerator: PS booster multipole correction magnets, Unac 2/3 & PSB transfer lines.

Converters for LHC
Four quadrant power converters, DC switch mode converter modules, Power converters modules (MaxiDiscap and MiniDiscap), AC/DC-DC converter modules, MAXIDISCAP power converter up to 1kV.

Successful stories

Example 2 – SME

PRECISION MECHANICS & ENGINEERING SECTOR



SIROCO, S.A.
SOCIEDADE INDUSTRIAL DE ROBOTICA E CONTROLO
www.siroco.com.pt



High precision copper machining

Machining of Precision

- Prototype manufacturing
- Tools and accessories manufacturing
- Execution of small and medium series

Industrial Equipments

- Industrial automation solutions
- Assembly lines
- Robotized cells
- Automatic testing systems
- Others according customer request

Successful stories

Example 3 – Start-up

SOFTWARE ENGINEERING SECTOR



doDOC®
Streamlining Scientific Writing



"doDOC helps researchers streamline scientific writing and collaboration, so they can focus on the science!"



The consortium chose doDOC to:

- Collaborate in a single platform
- Automate project and document workflows
- Securely access granular information
- Have complete oversight of all documents

2019-09-04 visit by MCTES + 60



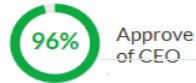
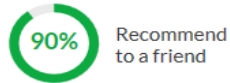
Portuguese People



A great place to work?

Courtesy of James PURVIS
(CERN - HR DH)

Google Reviews

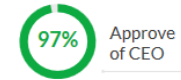
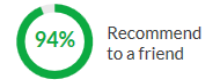


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CERN Reviews

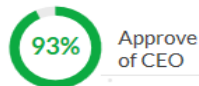
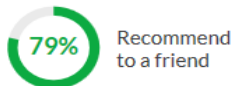
Updated 20 August 2017



Fabiola
Gianotti
50 Ratings



Apple Reviews



Tin
6,2k
High
Rab
201



LE TEMPS MÉDIA SUISSE DE RÉFÉRENCE

Les meilleurs employeurs se trouvent dans la recherche, l'horlogerie et la banque

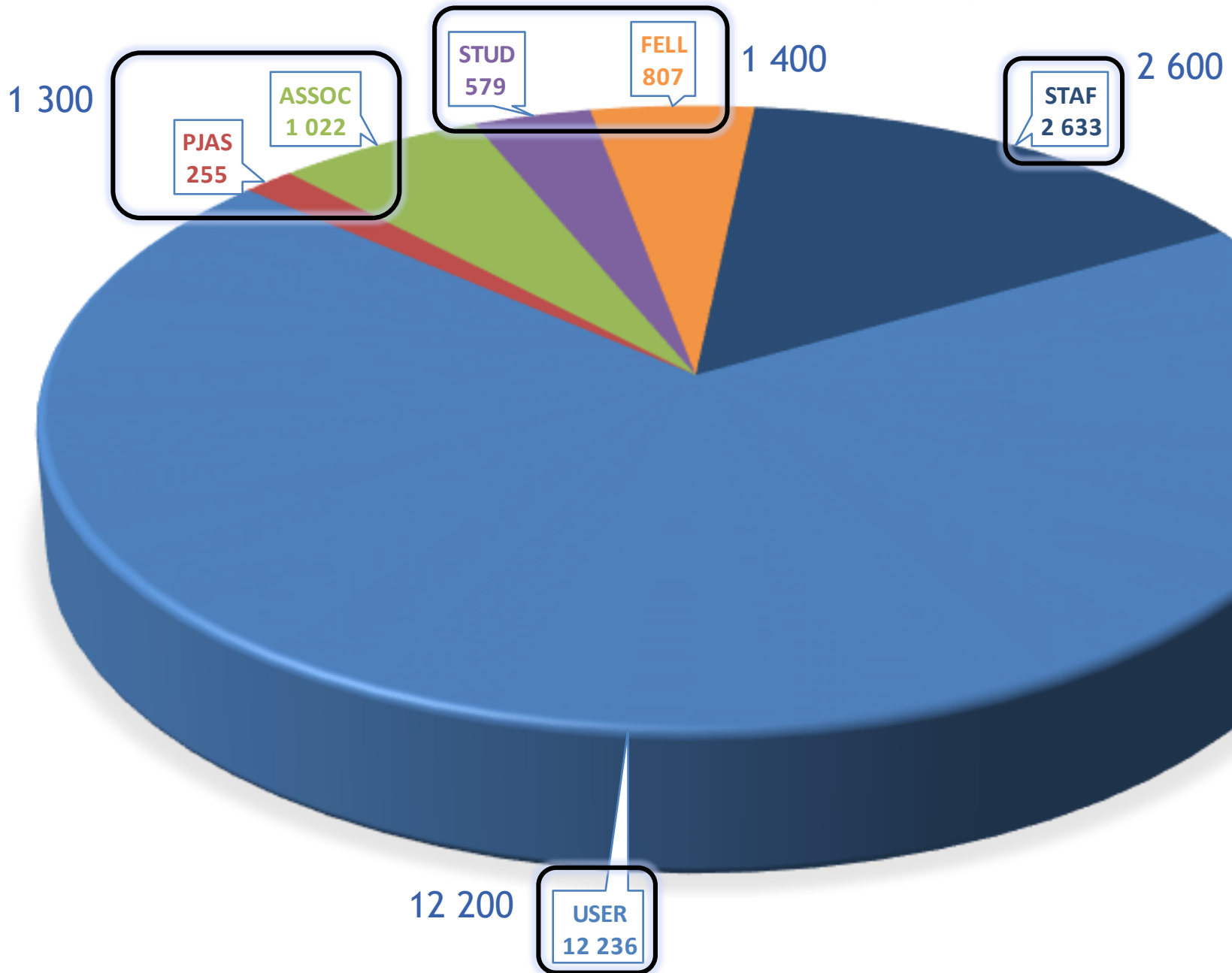
Rang Global	Employeur	Score
1	Rolex	8,59
2	La Mobilière	8,44
3	Chemins de fer rhétiques	8,41
4	CERN	8,41
5	Chocolat Frey	8,15
6	Philips	8,07
7	Ecole polytechnique fédérale de Lausanne	7,99
8	Banque nationale suisse	7,82
9	Banque cantonale des Grisons	7,77
10	Cisco	7,72

UNIVERSUM

CERN is ranked as an Attractive Employer

Switzerland	2016	2017	2018
Students			
Natural Sciences	4	3	4
IT	6	5	5
Health/Medicine	21	40	26
Engineering	3	3	4
Professionals			
Health/Medicine	22	29	-
Engineering	4	7	4
IT	6	7	8

17 500 CERNois (2017)



careers @ CERN

<http://careers.cern>



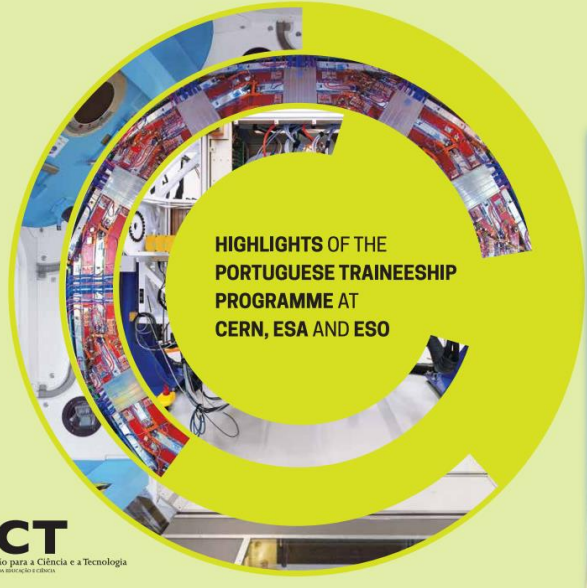
programme		positions / y	duration	required	open
Summer Student	SUMM	300	3 m	3 years of university studies	Autumn
Technical Student	TECH	240	12 m	2 years of university studies	Apr, Oct
Doctoral Student	DOC	80	3 y	enrolled in PhD in University	Apr, Oct
Staff	STAF	100 - 150	5 y	all levels	all time
Fellow	FELL	220	3 y	BSc, MSc or PhD (< 10 y experience)	Feb, Sep
Marie Curie	MC		3 y	MSc or PhD (< 5 y experience)	all time
Technical Training Experience	TTE	40	3 y	superior technician diploma (< 4 y experience)	all time
Trainee	FCT-TRNE	8 - 10	2 y	BSc, MSc or PhD	Sep/Oct
Project Associate	PJAS		3 y	BSc, MSc or PhD	all time



2016-10-28 CERN - IPLeiairia Protocol

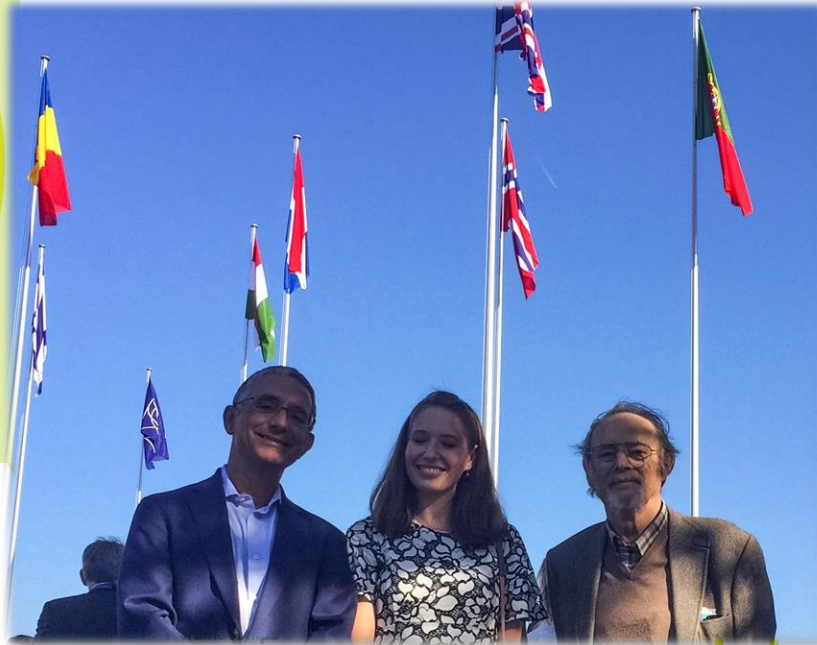


FCT Trainees (since 1996)

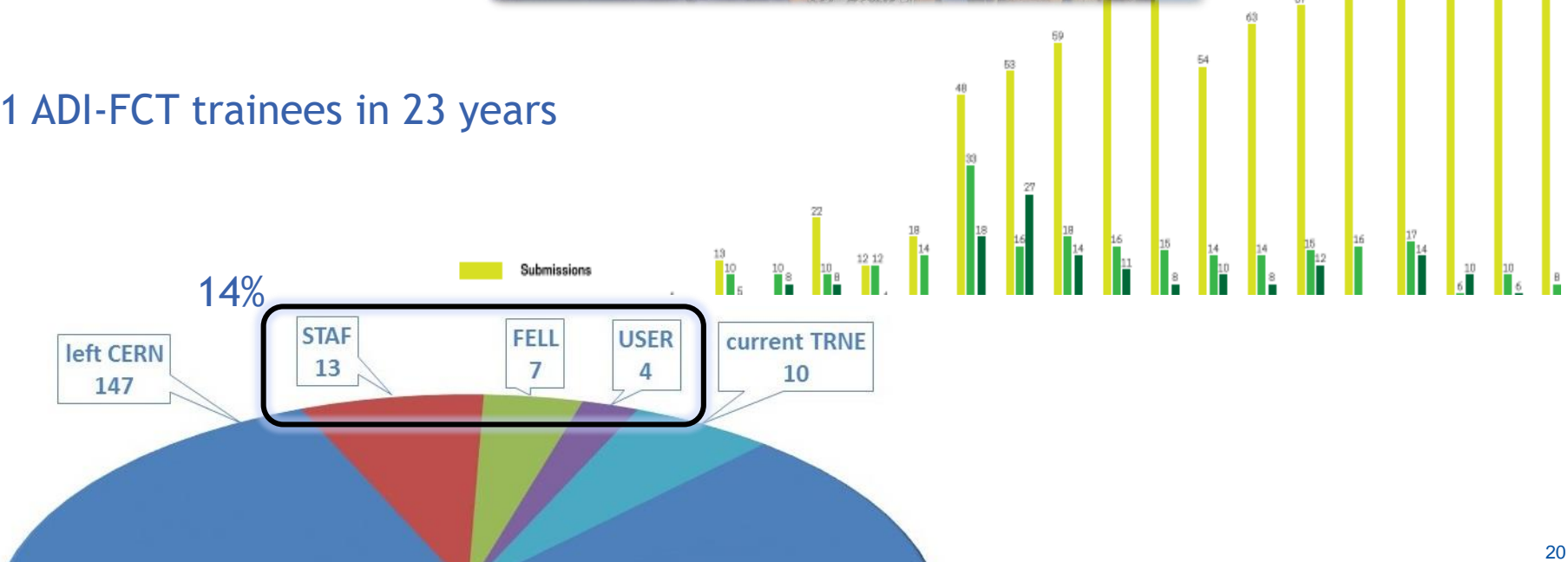


FCT
Fundação para a Ciência e a Tecnologia
Associação de Instituições de Ensino Superior

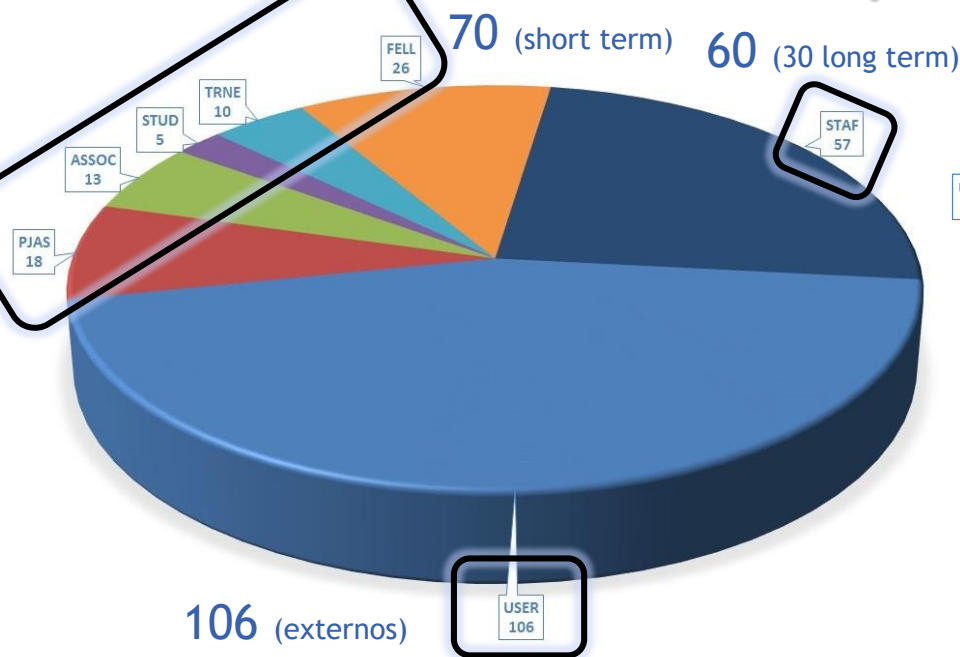
folheto bolsas FCT



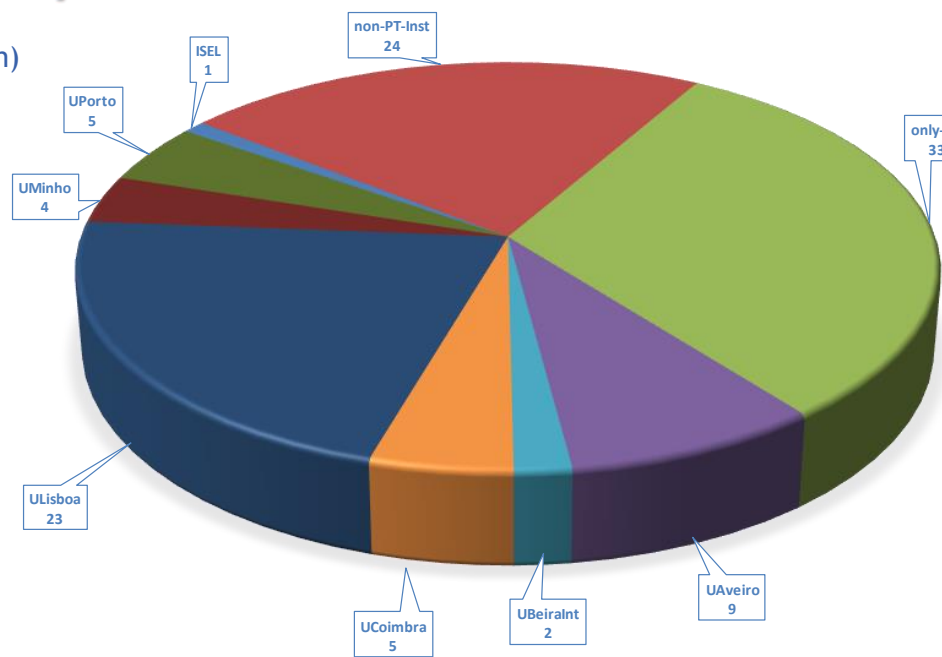
181 ADI-FCT trainees in 23 years



235 PT - CERNianos (2016)



106 users



2016-05-04 MCTES Heitor (Gaspar birthday)



PT people (2018)

Country	Staff members		Fellows		Doctoral students		Technical students		Admin. students		Normalized contribution
	hc	%	hc	%	hc	%	hc	%	hc	%	
GR	45	1.69	57	6.79	13	5.68	35	20.71	8	27.59	1.09
HU	15	0.56	11	1.31	3	1.31	4	2.37	1	3.45	0.60
IL	3	0.11									1.58
IN	2	0.08	11	1.31	1	0.44	5	2.96			1.07
IT	312	11.70	156	18.57	41	17.90	21	12.43	1	3.45	10.20
LT			1	0.12			1	0.59			0.09
NL	68	2.55	11	1.31	7	3.06	1	0.59			4.51
NO	17	0.64	20	2.38	3	1.31	6	3.55	1	3.45	2.65
PK	1	0.04	1	0.12	3	1.31	5	2.96	1	3.45	0.13
PL	73	2.74	68	8.10	15	6.55	21	12.43	3	10.34	2.76
PT	61	2.29	21	2.50	4	1.75	1	0.59			1.08
RO	18	0.68	11	1.31			3	1.78	2	6.90	1.00
RS	5	0.19	1	0.12			3	1.78	2	6.90	0.17
SE	26	0.98	8	0.95	4	1.75	4	2.37	1	3.45	2.63
SI					1	0.44					0.09
SK	13	0.49	7	0.83	2	0.87	3	1.78			0.48
TR			2	0.24	2	0.87	2	1.18	1	3.45	0.49
UA	1	0.04	3	0.36	2	0.87	3	1.78	1	3.45	0.09
NMS	8	0.30	58	6.90	7	3.06	3	1.78			
Total	2,666		840		229		169		29		

2011 EC D.Barroso



2012-12-18 FCT M.Seabra, M.Gago



tribute to Gaspar by F.Gianotti & M.Heitor

2019-09-04



2016-05-04

