

# IGFAE

## INSTITUTO GALEGO DE FISICA DE ALTAS ENERXIAS

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1st LIP-IGFAE workshop - Braga

May 4th 2018



# IGFAE CREATED IN 1999

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## EXPOÑEN

### PRIMEIRO

Que a Xunta de Galicia ten a vontade de fomentar o desenvolvemento da física de altas enerxías, especialmente na vertente experimental, e das tecnoloxías que se relacionan con este campo específico.

### SEGUNDO

Que existen grupos de investigadores, tanto experimentais como teóricos, que traballan neste campo na USC, en relación co Laboratorio Europeo de Física de Partículas (CERN).

### TERCEIRO

Que non se dispón nestes momentos de instrumentos axeitados para rendibilizar o retorno industrial que ofrece o CERN.

### CUARTO

Que a Xunta de Galicia e a USC consideran necesario participar e colaborar no esforzo que se vén facendo neste campo desde a reincorporación de España ó CERN en 1983, que actualmente se reflicte no Plan Nacional de Física de Altas Enerxías, así como nos esforzos realizados por outras comunidades autónomas neste campo científico.

Joint research center  
Xunta-Universidade de  
Santiago de Compostela

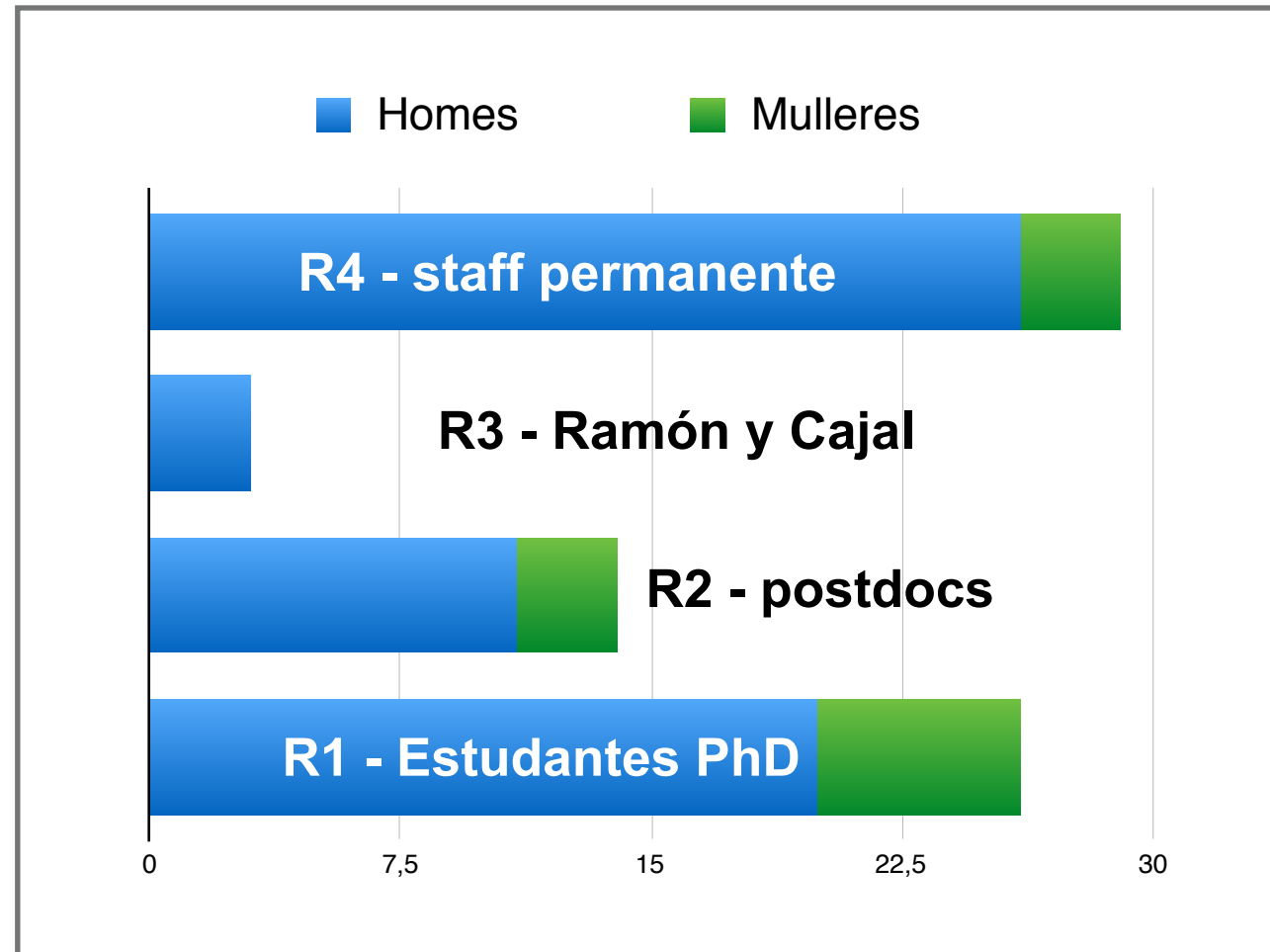
*Joint research center means :  
Government of the Institute  
(Governing Board) formed  
by representatives of both  
institutions, not only  
university.*

*In 2017 we were awarded a Maria de Maeztu unit of excellence*



*First in Galicia - very prestigious in Spain - new phase for IGFAE*

# DISTRIBUCIÓN DO PERSOAL



## Personnel

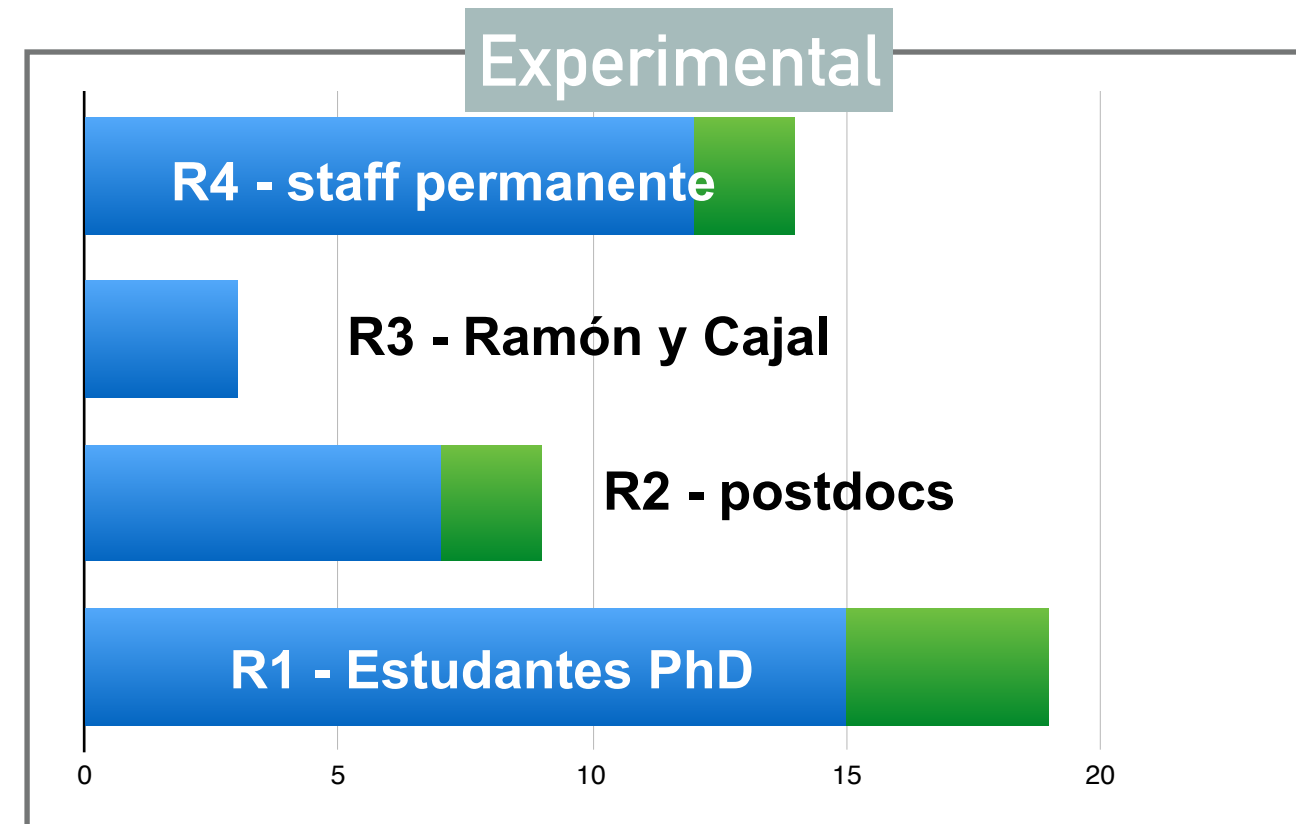
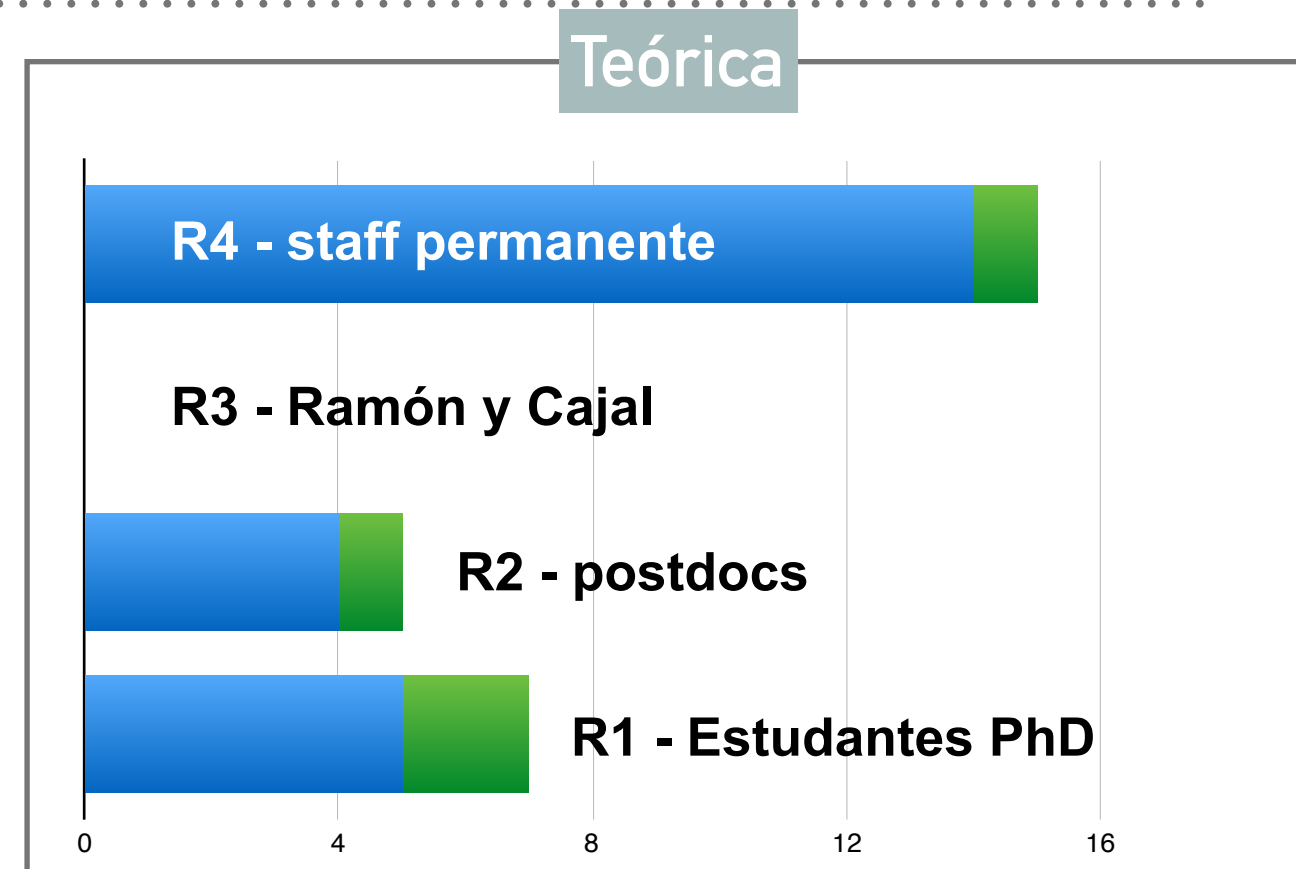
29 permanent (mostly university)

3 Ramon y Cajal

14 Postdocs

26 Students

5 Administration and technical



# RESEARCH AT IGFAE

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## Organized around three thematic Strategic Research Areas

SA1. The Standard Model to the limits - Convener Elena Ferreiro

SA2. Cosmic Particles and Fundamental Physics - Convener Jaime Alvarez

SA3. Nuclear Physics from the LAB to improve people's health - Convener Dolores Cortina

HORIZONTAL LINE: Define strategies for new facilities/Experiments - Nestor Armesto

### *SA1 – THE STANDARD MODEL TO THE LIMITS*

*RL1. Beyond the SM searches with LHCb (ERC/StG – Diego Martinez)*

*RL2. Hot and dense QCD in the LHC era and beyond (ERC/StG – Carlos Salgado)*

*RL3. String theory and relation with other fields*

### *SA2 – COSMIC PARTICLES AND FUNDAMENTAL PHYSICS*

*RL4. Extremely energetic cosmic rays and neutrinos – Large exposure experiments*

*RL5. Dark Matter and the nature of neutrinos – Low background experiments*

### *SA3 – NUCLEAR PHYSICS FROM THE LAB TO IMPROVE PEOPLE'S HEALTH*

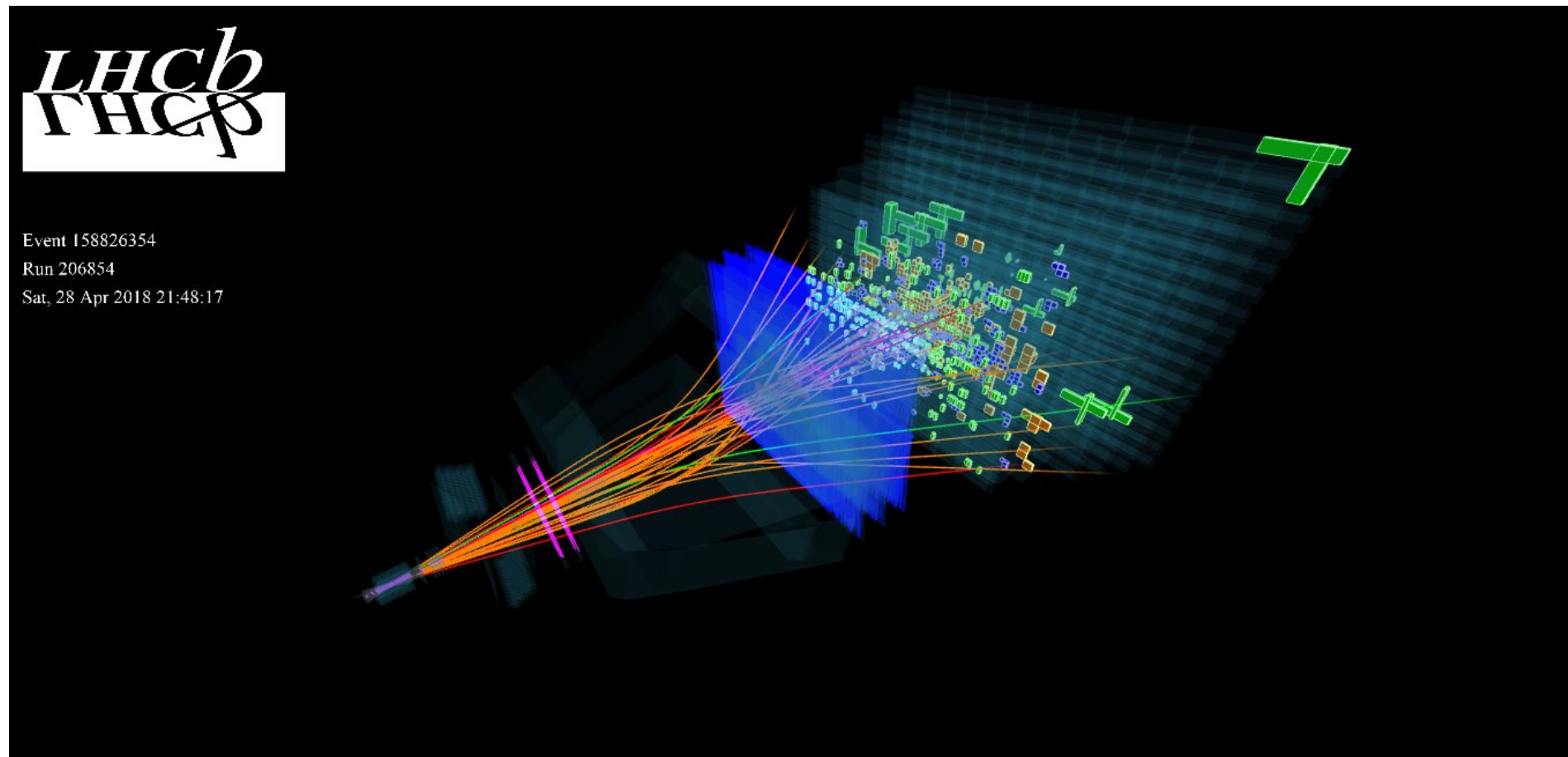
*RL6. The structure of the nuclear many-body systems and its astrophysical and cosmological implications*

*RL7. Commissioning and exploitation of the Laser Laboratory for Accelerator and Applications*

***Gravitational Wave detection - new line to be open in September***

# RL1. LHCb

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*Strong involvement of IGFAE - talk by Cibran*

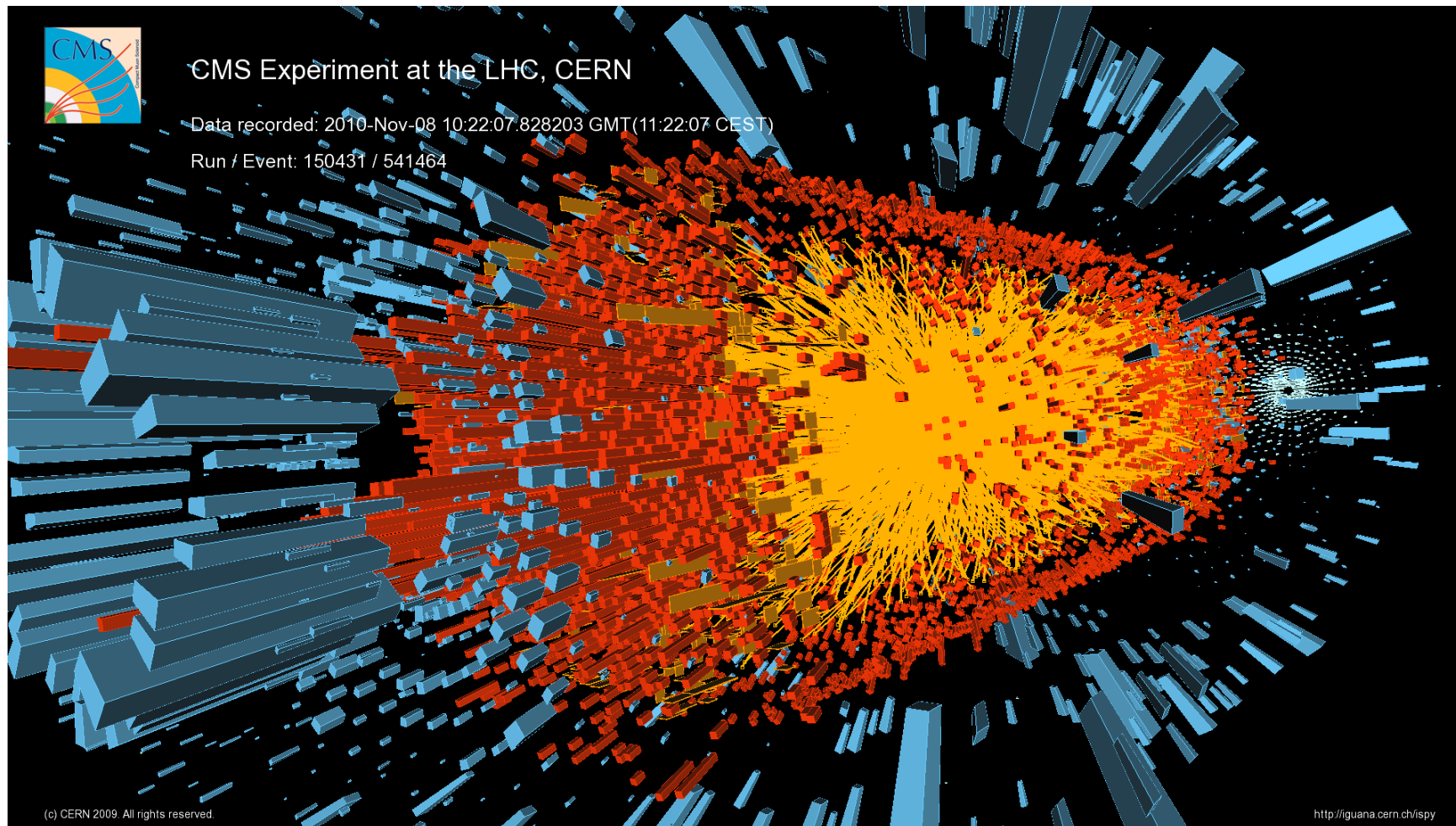
Instrumentation  
25% of Silicon Tracker  
Upgrade - VELO

Analysis  
Some of the most relevant analysis  
from LHCb from members of IGFAE  
(e.g.  $B_s \rightarrow \mu \mu$  in Run1)



# RL2. HOT AND DENSE QCD

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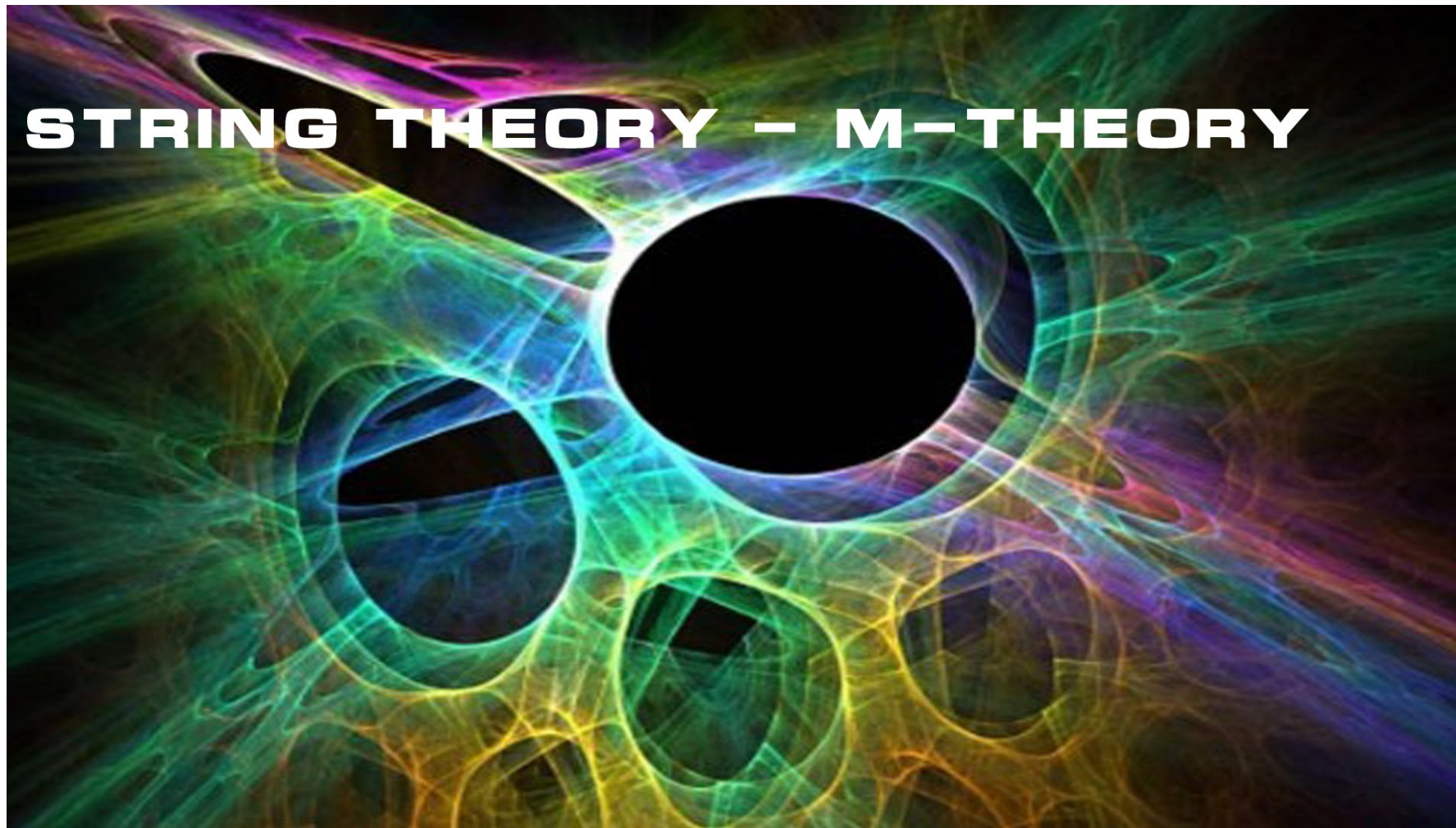
*Strong groups in Lisbon and IGFAE*

*Jet quenching,  $n$ PDFs, small- $x$ /saturation, percolation of strings...*

**Strong historical relation IGFAE-LIP**

# RL3. STRING THEORY

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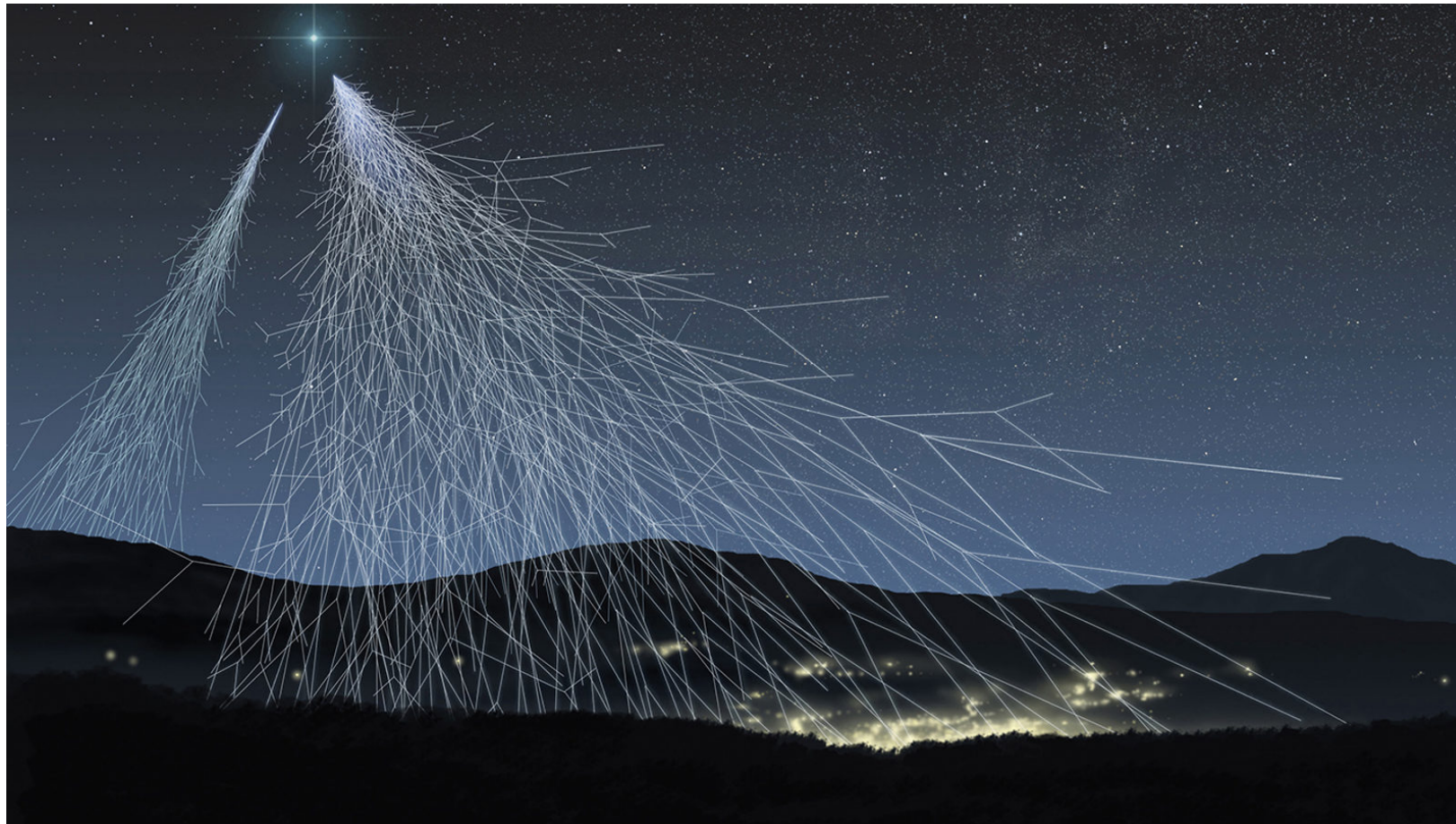
*Interest in AdS/CFT correspondence, formal aspects, relation with condense matter, gravitation. New activity in numerical holography*

*Relation with Portuguese groups (mainly Porto) but not LIP*



# RL4. AUGER

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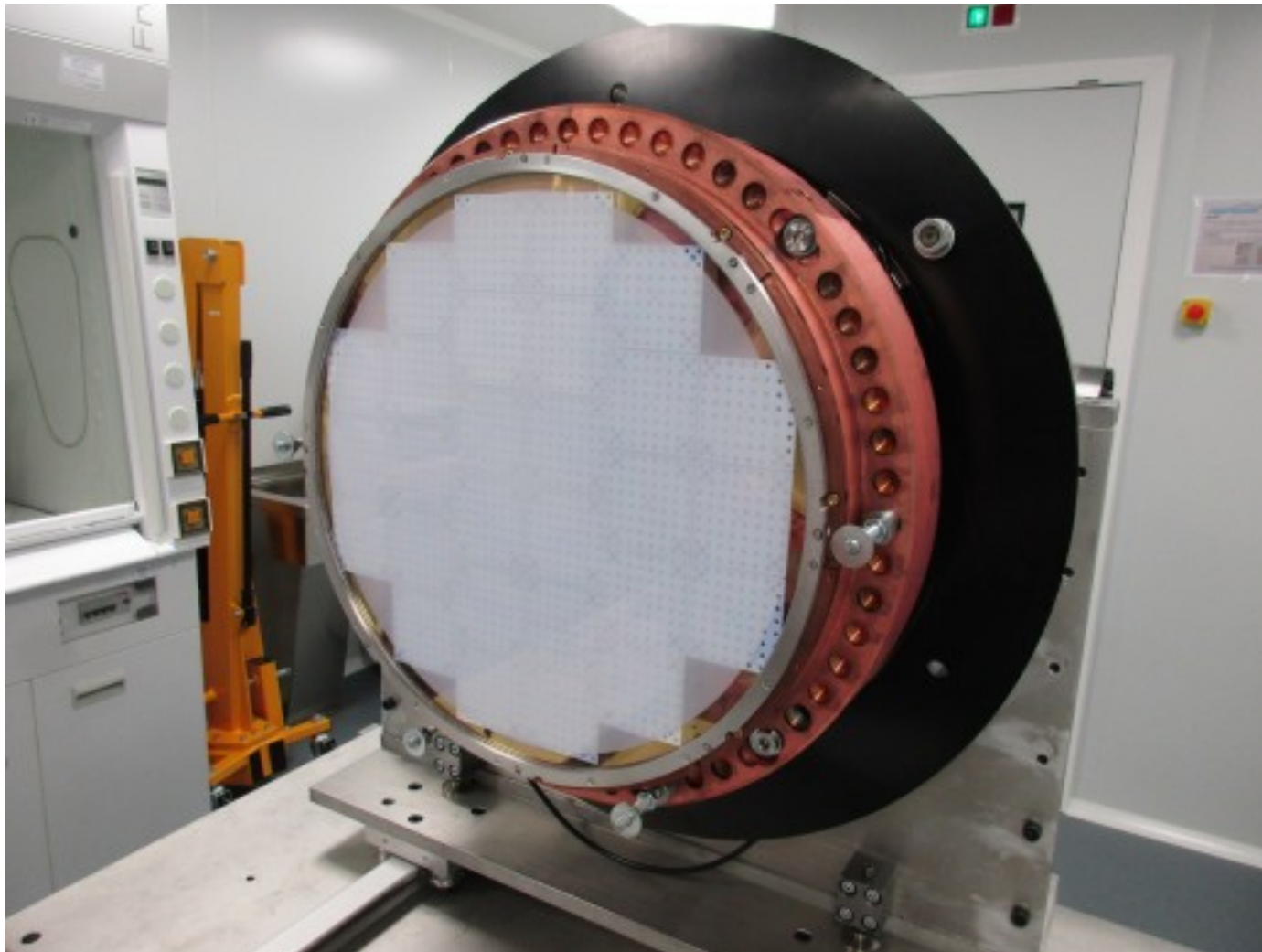
*IGFAE members pioneered some of the most important measurements*

*Talks E Zas, J Alvarez-Muñiz (also JA Garzon)*

**Strong historical relation IGFAE-LIP**

# RL5. NEXT

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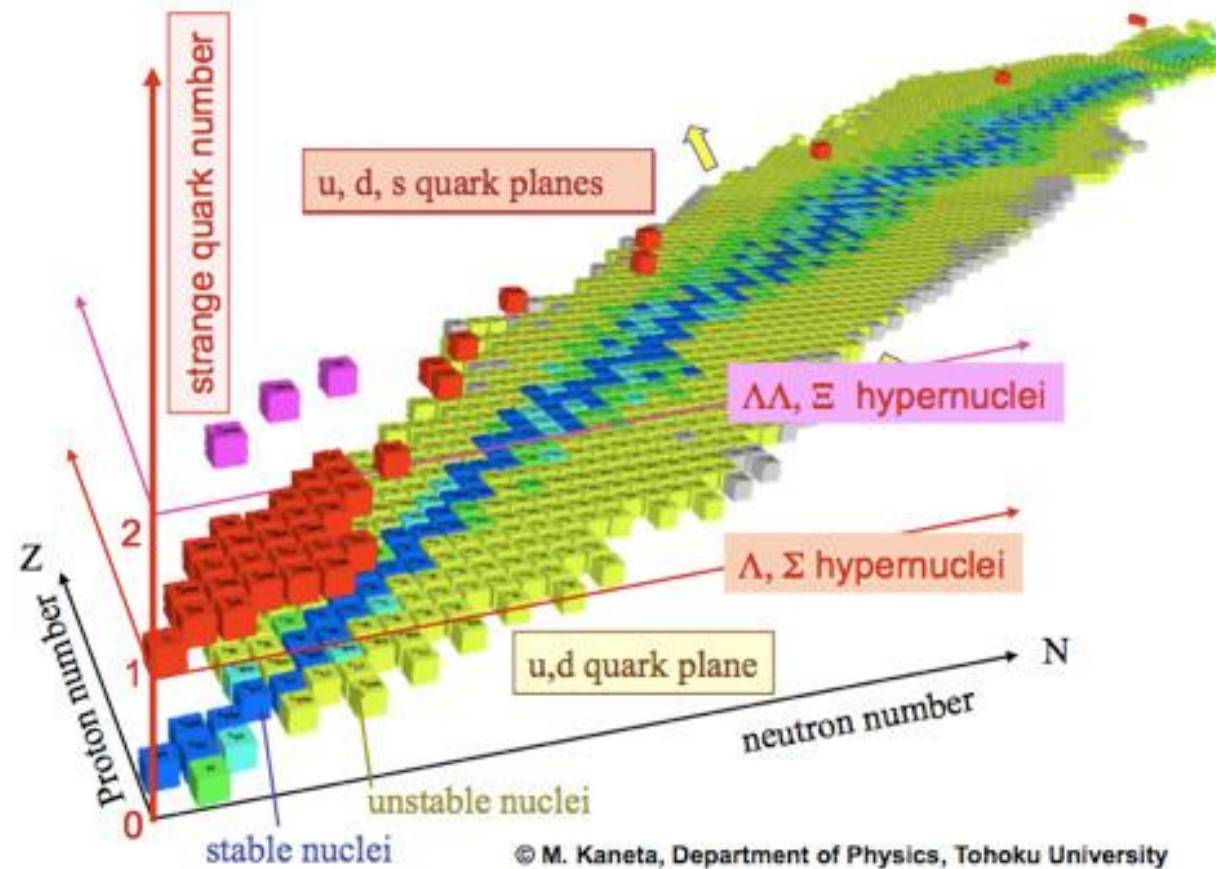


*Neutrino-less double beta decay with gaseous detectors - Next experiment*

Relation IGFAE-LIP for instrumentation

# RL6. NUCLEAR EXPERIMENT

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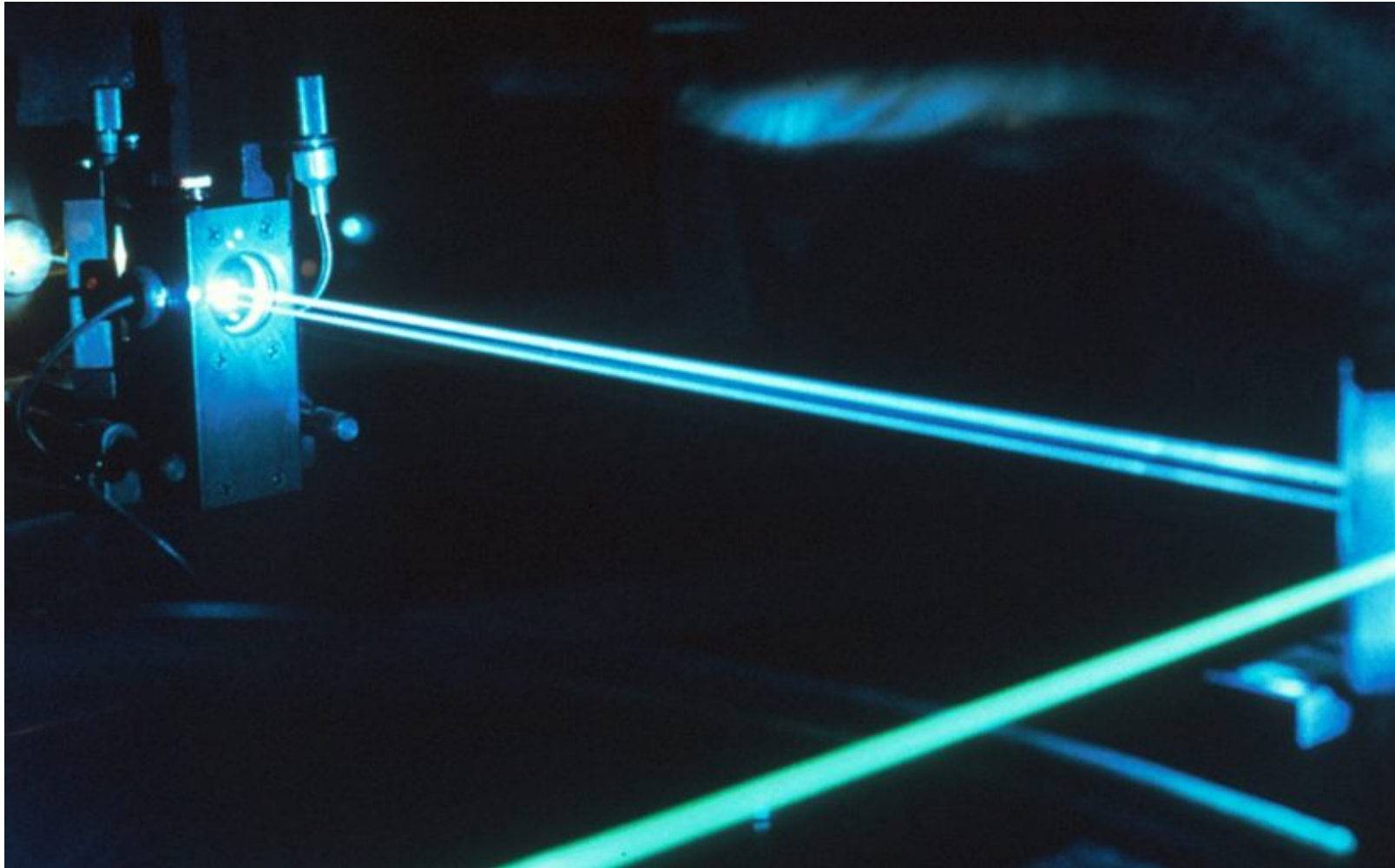
*Research on nuclear structure (Talks D Cortina, H Alvarez Pol)*

*Strong involvement in FAIR (D Cortina R3B spokesperson), nTOF, GANIL, ISOLDE...*



# RL7. LASER-PLASMA ACCELERATION

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*New facility in Santiago - laser-plasma acceleration*

*Multi-purpose facility. In particular LASERPET experiment - proof of concept to produce short-lived isotopes for medical use*

# INTERNATIONALIZATION

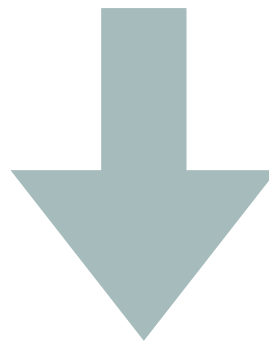
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## ACTIONS TO IMPROVE INTERNATIONAL PERFORMANCE

PLAN OF PARTNERSHIPS TO SUPPORT INTERNATIONAL ACTIVITIES (PROJECTS, MOBILITY, TRAINING, ETC).

In order to strengthen international scientific leadership and develop the research activity at the highest level, IGFAE needs interdisciplinary cooperation with renowned international research institutions. Our strategy relays on joining efforts, resources and expertise with the best researchers outside our borders.

*[From the MdM IGFAE Strategic Plan]*



*Reinforcement of the links LIP - IGFAE*

Instrumentation

Astroparticle

Theory

Training (IDPASC)

...



# FROM NESTOR'S SUMMARY AT IGFAE-RETREAT 2017

## To start the discussion:

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	...	
RL1	LHCb: upgrade 1																						
				LHCb: upgrade 2																			
RL2	RHIC-II, HL-LHC for ions																						
				ep/eA colliders																			
RL3	Applications to hot and dense QCD, thermalisation, condensed matter, cosmology																						
RL4	Auger to AugerPrime																						
RL5	NEXT, RD51																						
				NEXT-nT?; RD51 for directional DM?; DUNE?																			
SA3	GSI, GANIL, ISOLDE																						
	FAIR (R <sup>3</sup> B, something else?), SPIRAL2, HIE-ISOLDE																						
	LaserPet as an isotope factor proof-of-concept, plasma acceleration, laser facility																						
TH	Our missing items: BSM, cosmology, new perturbative techniques, NP,...																						
EXP	Another LHC experiment?; ILC?; GW experiments?; CTA?; Multimessenger?; Neutrino?; SKA?; ...?																						

- From my point of view, participation in large scale facilities/large experiments ( $\cong$  large production) is capital for the future of the IGFAE: clear plans needed!!!