

LIP:

Experiência ATLAS

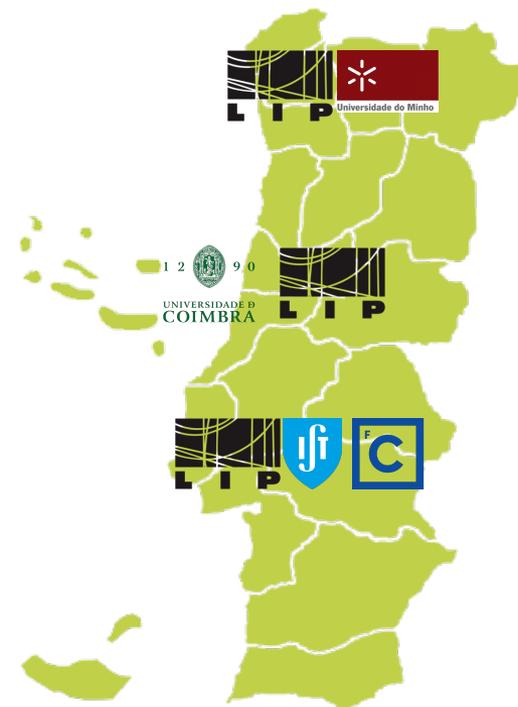
Apresentação dos grupos de investigação do
Departamento de Física

Ricardo Gonçalo pelo grupo ATLAS do LIP

Física de Partículas em Portugal

- Lisboa, Coimbra, Minho
- 200 membros
- 90 doutorados
- 75 estudantes
- 25 engenheiros e administrativos

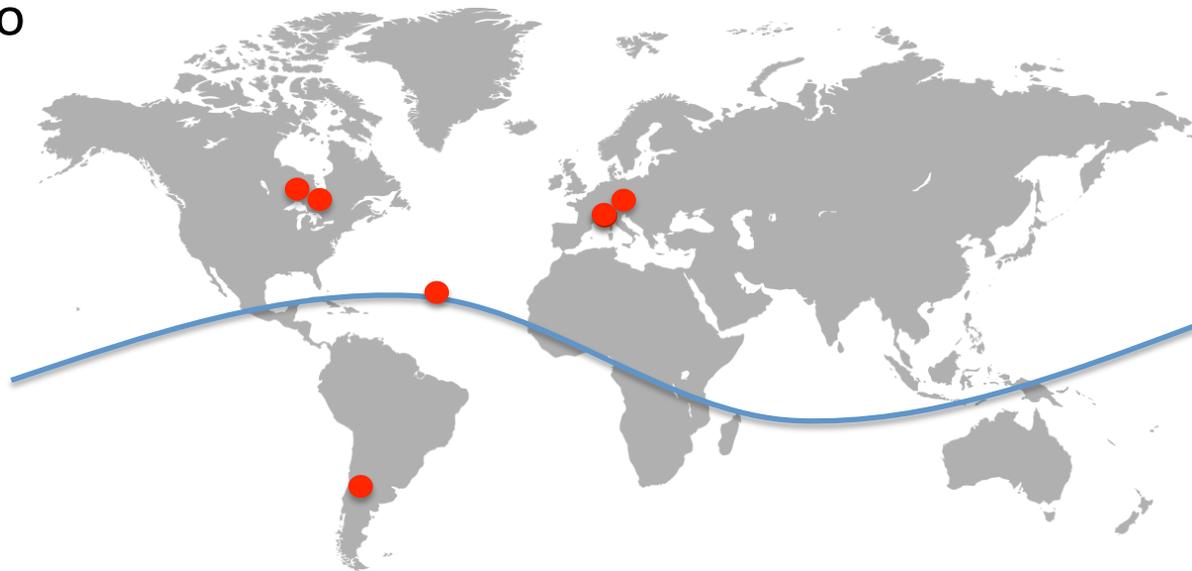
www.lip.pt



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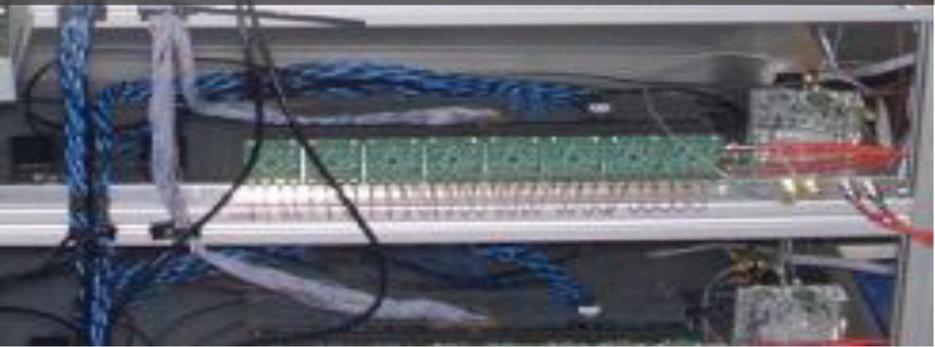


LIP Scientific infrastructures

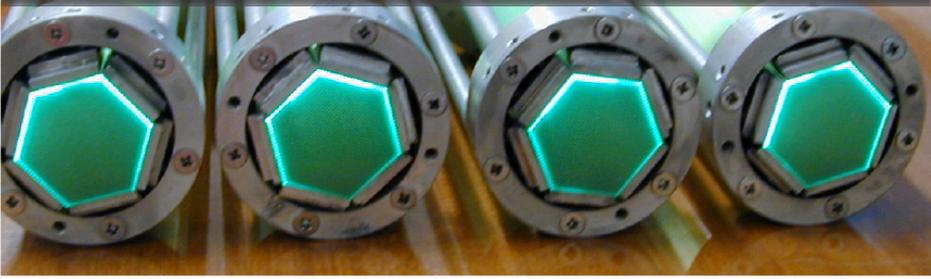
Precision mechanical Workshop
Prototype production & small series. Coimbra

A photograph showing a person in a light-colored shirt and dark pants standing in a workshop, operating a large industrial machine with a computer monitor. The machine is a CNC lathe or similar precision manufacturing equipment. The workshop floor is concrete, and there are various tools and equipment visible in the background.

Detectors laboratory
key role in gaseous detector development Coimbra

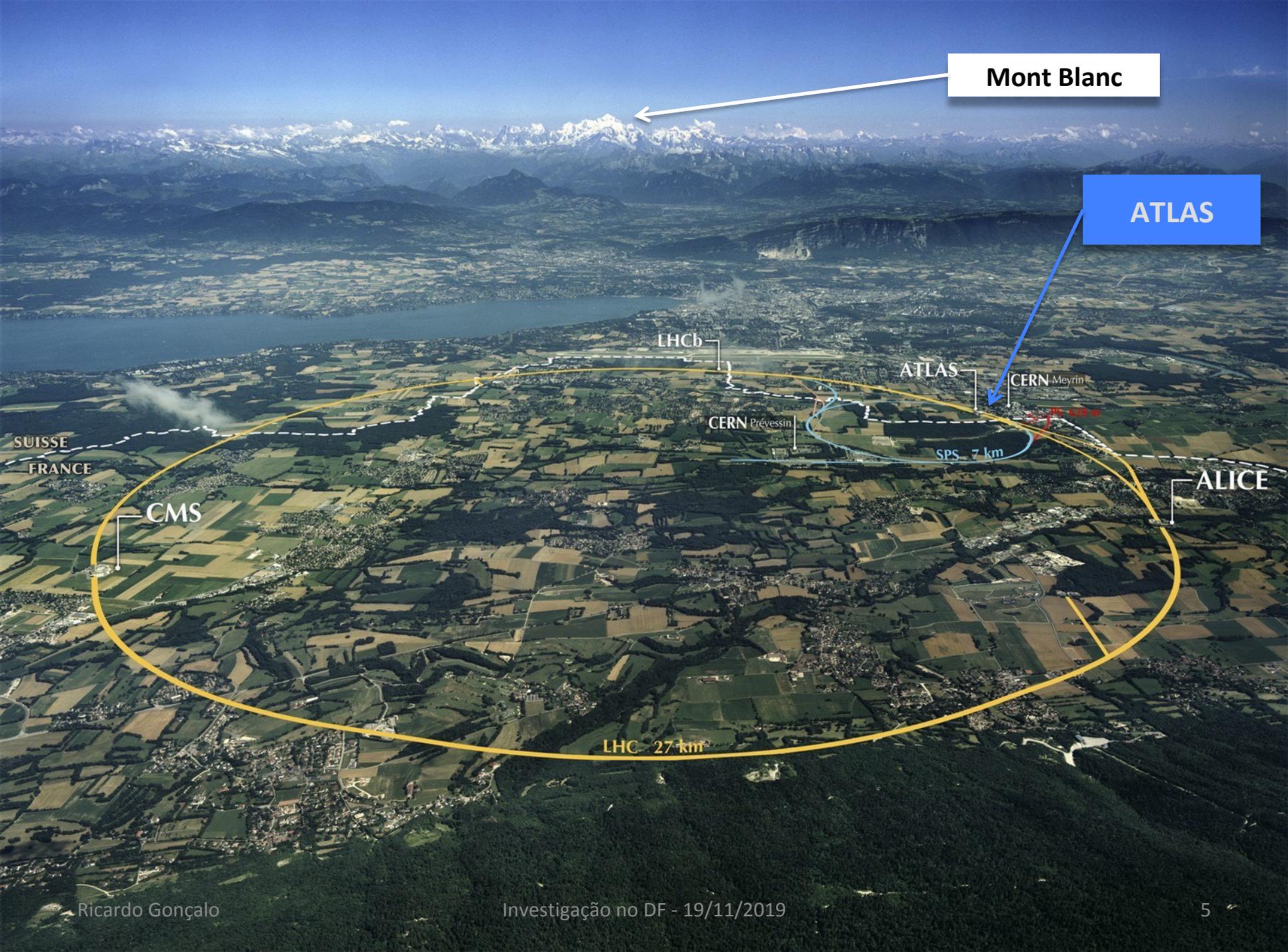
A photograph showing a close-up of a detector assembly. It features a long, horizontal strip of green material, possibly a scintillator or gas detector, with numerous blue and black cables connected to it. The assembly is housed in a metal frame.

Optical fibers and scintillators lab
A key role in ATLAS Lisboa

A photograph showing four cylindrical detector components arranged in a row. Each component has a glowing green hexagonal center, likely a scintillator or fiber optic end. The components are mounted on a wooden surface.

Electronics laboratories
Key role in CMS, Auger and medical applications
Lisboa | Coimbra | CERN

A photograph showing a close-up of a green printed circuit board (PCB) populated with various electronic components, including integrated circuits, capacitors, and connectors. The board is densely packed with components.



Mont Blanc

ATLAS

SUISSE
FRANCE

LHCb

ATLAS

CERN Meyrin

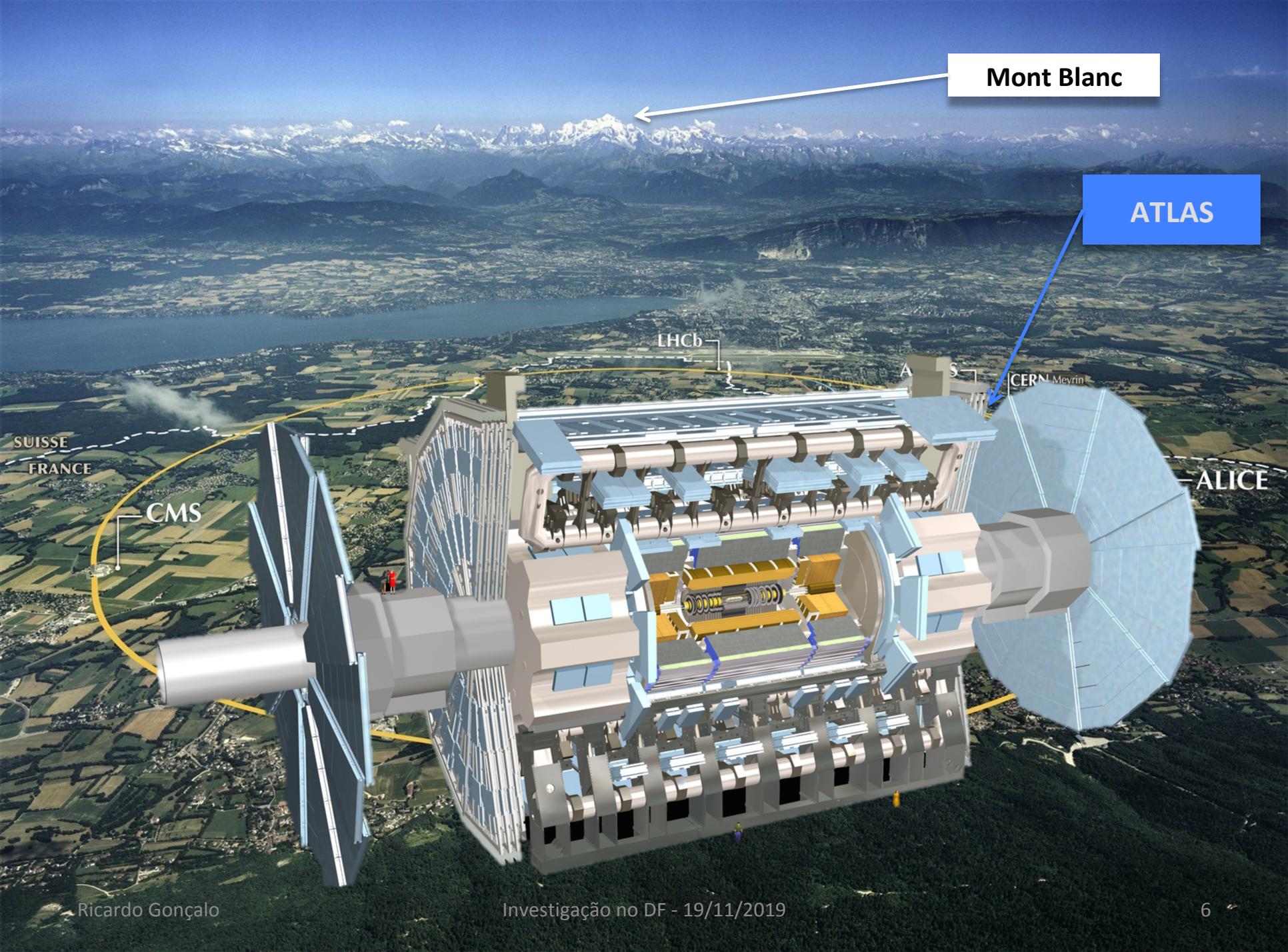
CERN Prévessin

SPS 7 km

ALICE

CMS

LHC 27 km



Mont Blanc

ATLAS

LHCb

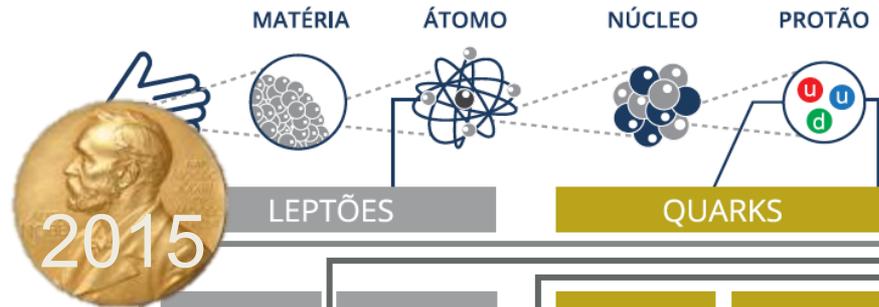
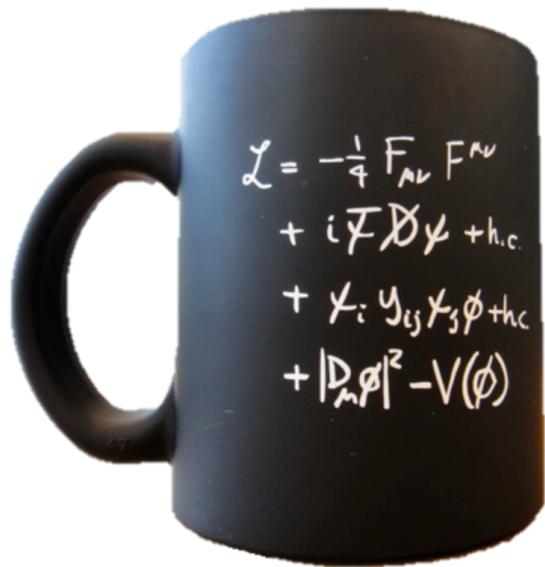
CERN Meyrin

SUISSE
FRANCE

CMS

ALICE

O Modelo Padrão da Física de Partículas



2015

1ª	ν_e NEUTRINO DO ELETRÃO 0 1/2	e ELETRÃO -1 1/2	u UP 2/3 1/2	d DOWN -1/3 1/2
2ª	ν_μ NEUTRINO DO MUÃO 0 1/2	μ MUÃO -1 1/2	c CHARM 2/3 1/2	s STRANGE -1/3 1/2
3ª	ν_τ NEUTRINO DO TAU 0 1/2	τ TAU -1 1/2	t TOP 2/3 1/2	b BOTTOM -1/3 1/2

Z BOSÃO Z 0 1	γ FOTÃO 0 1	g GLUÃO 0 1
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FORÇA ELETROMAGNÉTICA (Z, γ) and FORÇA FORTE (g)

W^\pm BOSÃO W 1 1	H HIGGS 0 0
---------------------------	---------------------

FORÇA FRACA (W) and HIGGS (H)

PARTÍCULAS DAS FORÇAS

PARTÍCULAS DE MATÉRIA

Para cada uma destas partículas, existe uma antipartícula de carga oposta (antimatéria)



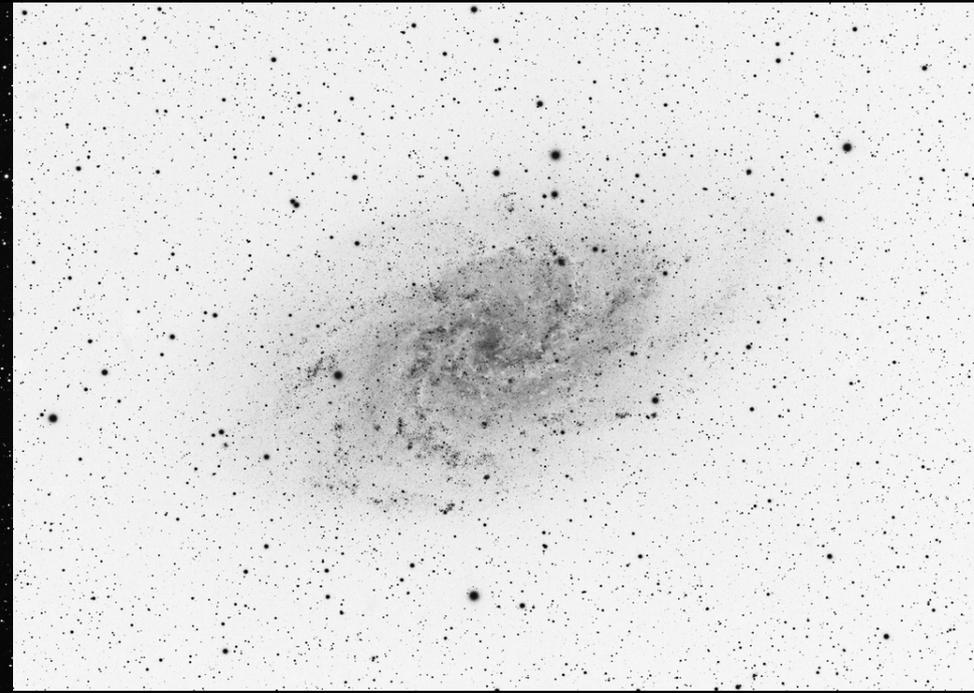
O que é a Matéria Escura

Matéria escura
(reconstrução)

Gás interestelar
(reconstrução)

Matéria escura
(reconstrução)

Para onde foi a antimatéria?



- Quantidades iguais de matéria e antimatéria “deviam” ter sido produzidas no Big Bang
- Medimos a violação de uma simetria fundamental (CP) que pode explicar a diferença, mas precisamos de encontrar outras fontes
- Violação CP no sector dos leptões? Ou no sector do Higgs?



SIF HC spa
PROGETTAZIONI
IMPIANTI
COSTRUZIONE MONTAGGIO
INDUSTRIALI
Via Vittorio Veneto, 120/2 - C
PERANNA (Cuneo) - Tel. 0174.906.611

Particle identification

μ
MUÃO
-1
 $\frac{1}{2}$

u UP $\frac{2}{3}$ $\frac{1}{2}$	d DOWN $-\frac{1}{3}$ $\frac{1}{2}$
c CHARM $\frac{2}{3}$ $\frac{1}{2}$	s STRANGE $-\frac{1}{3}$ $\frac{1}{2}$
t TOP $\frac{2}{3}$ $\frac{1}{2}$	b BOTTOM $-\frac{1}{3}$ $\frac{1}{2}$

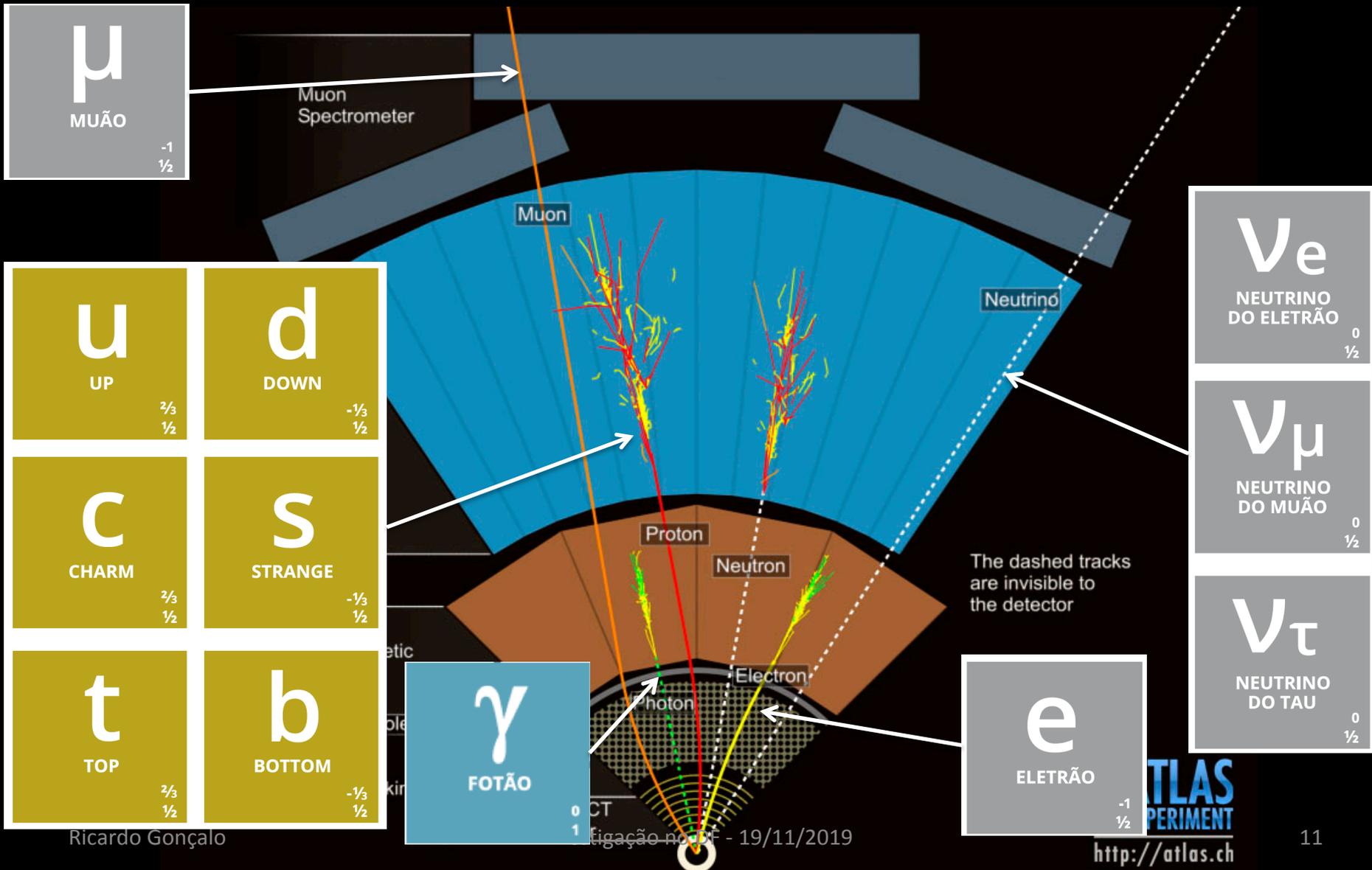
γ
FOTÃO
0
1

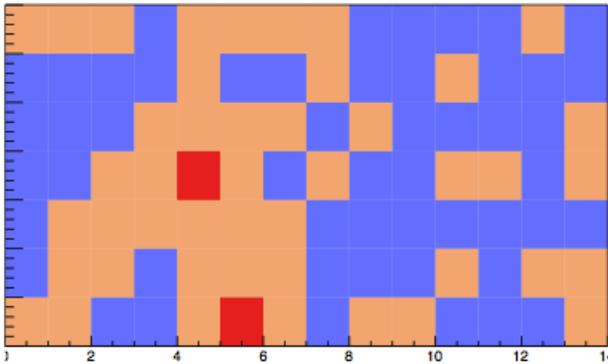
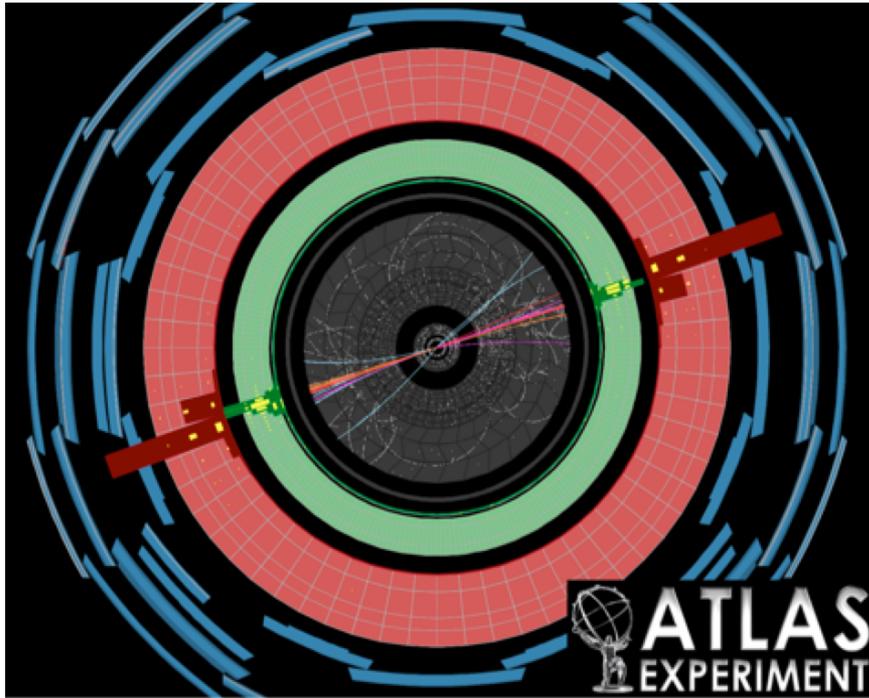
ν_e
NEUTRINO DO ELETRÃO
0
 $\frac{1}{2}$

ν_μ
NEUTRINO DO MUÃO
0
 $\frac{1}{2}$

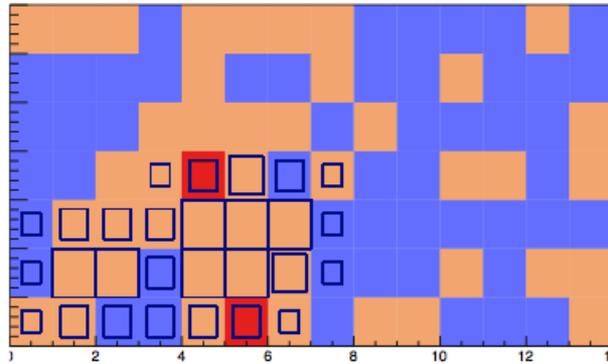
ν_τ
NEUTRINO DO TAU
0
 $\frac{1}{2}$

e
ELETRÃO
-1
 $\frac{1}{2}$

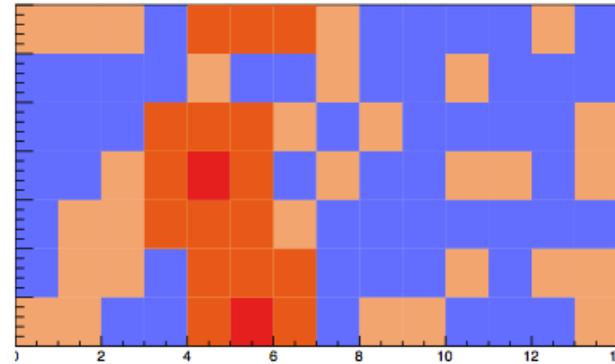




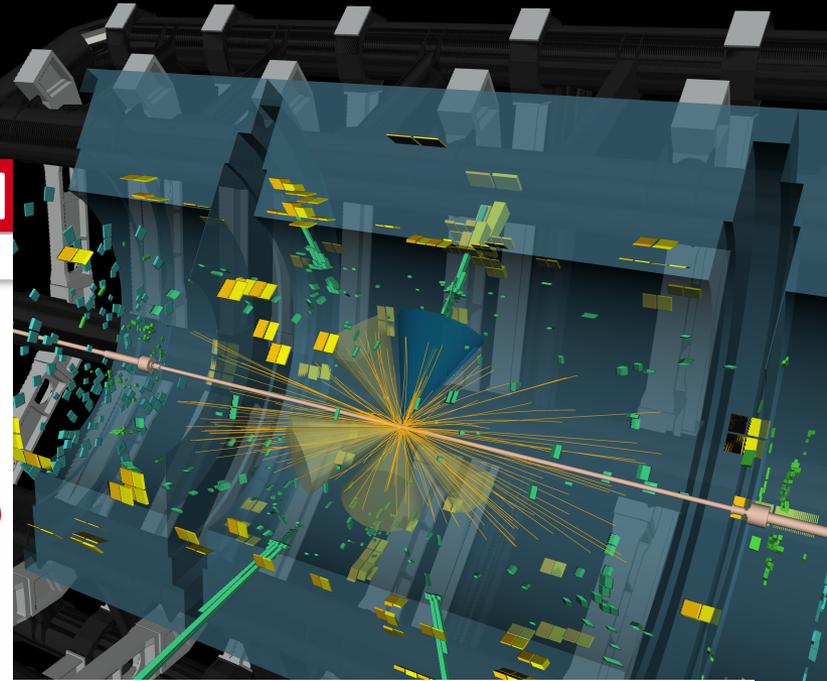
Ricardo Gonçalo



Investigação no DF - 19/11/2019



Últimas novidades (só Higgs... há mais!)



☰ 🔍 📖 **P** P2 ÍPSILON CULTO FUGAS P3 CINECARTAZ Entrar Assine já

CIÊNCIA > ESPAÇO MEDICINA ECOSFERA

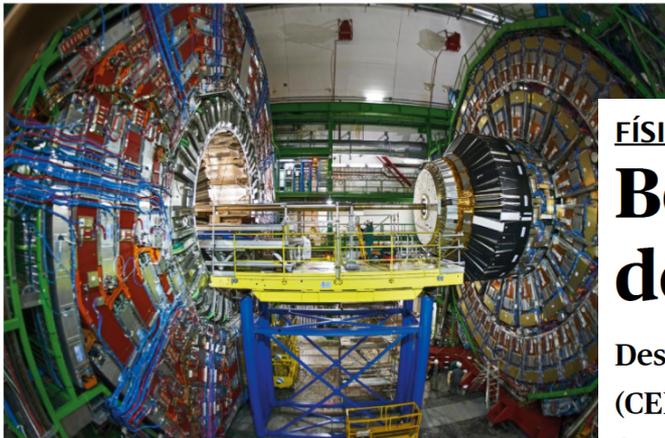
FÍSICA DE PARTÍCULAS

Bosão de Higgs revela que relação mantém com o quark *top*

Investigadores portugueses participaram na descoberta.

PÚBLICO · 4 de Junho de 2018, 19:42

418
PARTILHAS



O detector CMS no grande acelerador de partículas LHC, em Genebra

FÍSICA DE PARTÍCULAS

Bosão de Higgs visto (finalmente) a desintegrar-se em quarks *bottom*

Descoberta anunciada no Laboratório Europeu de Física de Partículas (CERN) é um passo fundamental para perceber como o bosão de Higgs faz com que as partículas fundamentais adquiram massa.

PÚBLICO · 28 de Agosto de 2018, 17:47



<https://www.lip.pt/atlas/>
atlasinfo@lip.pt

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Ricardo Gonçalo (jgoncalo@uc.pt)



ATLAS

Real name: Johnny Rammond

Occupation: Head of the O.P.T.C.— Optic City Planning Committee

Identity: Known to his best friend Toby Whey

Legal status: Johnny Rammond is a United States citizen, Atlas is considered "above the law"

Place of birth: Hefffield, Nebraska

Marital status: Single

Known relatives: Sturgill Rammond (father, deceased), Dorothy Rammond (mother, deceased), Toby Whey (best friend)

Base of operations: The Optic City Planning Center, as well as his secret laboratory in a hidden chamber of his house

First appearance: *All Time Comics: Crime Destroyer #1*

Origin: Johnny Rammond came to the big city from the Midwest with a couple bucks in his pocket and stars in his eyes. He soon found the reality of Optic City a harsher one than he could have dreamed. After months of hardship and difficulty, he was reduced to sleeping in the sewers of the city with the other underground denizens of the underground communities. One night he came upon a mugging and in trying to stop it, he was assaulted and badly hurt. He managed to crawl back into the sewers. He was washed into a drain which took him into a deeper level of the under city than any human had ever been, one which was constructed by ancient aliens many aeons before human beings arrived on the continent. There, mysterious, cosmic machines whirred to life and, sensing Rammond's innate good nature and well-meaning spirit, imbued him with one of the most powerful weapons on the planet, his multi-channel, anti-matter-powered communicator / signal ring. Rammond's second life as Optic City's mightiest costumed hero began that day. His only weakness is when uncertainty and fear take hold in his mind

Height: 6'1"

Weight: 215 lbs.

Eyes: Blue

Hair: Blonde

Powers: Atlas's anti-matter ring gives him multiple powers, including super strength, super speed, the ability to fly, anti-matter rays which shoot out of his eyeballs, the ability to absorb tremendous trauma, the ability to communicate with whoever wears his other ring from anywhere in the universe, etc.

Weapons: Anti-matter power ring

Para que serve uma licenciatura/um mestrado / um doutoramento em física? (*)

Professor e Investigador

Tecnologia e inovação CERN

Aceleradores

Investigadora no CERN

Imagiologia médica



Analista financeiro

<https://www.lip.pt/carreiras-e-tecnologia/>

Ricardo Gonçalo

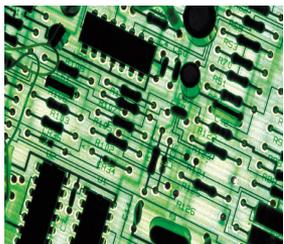
Software para radioterapia

Telecomunicações redes óticas

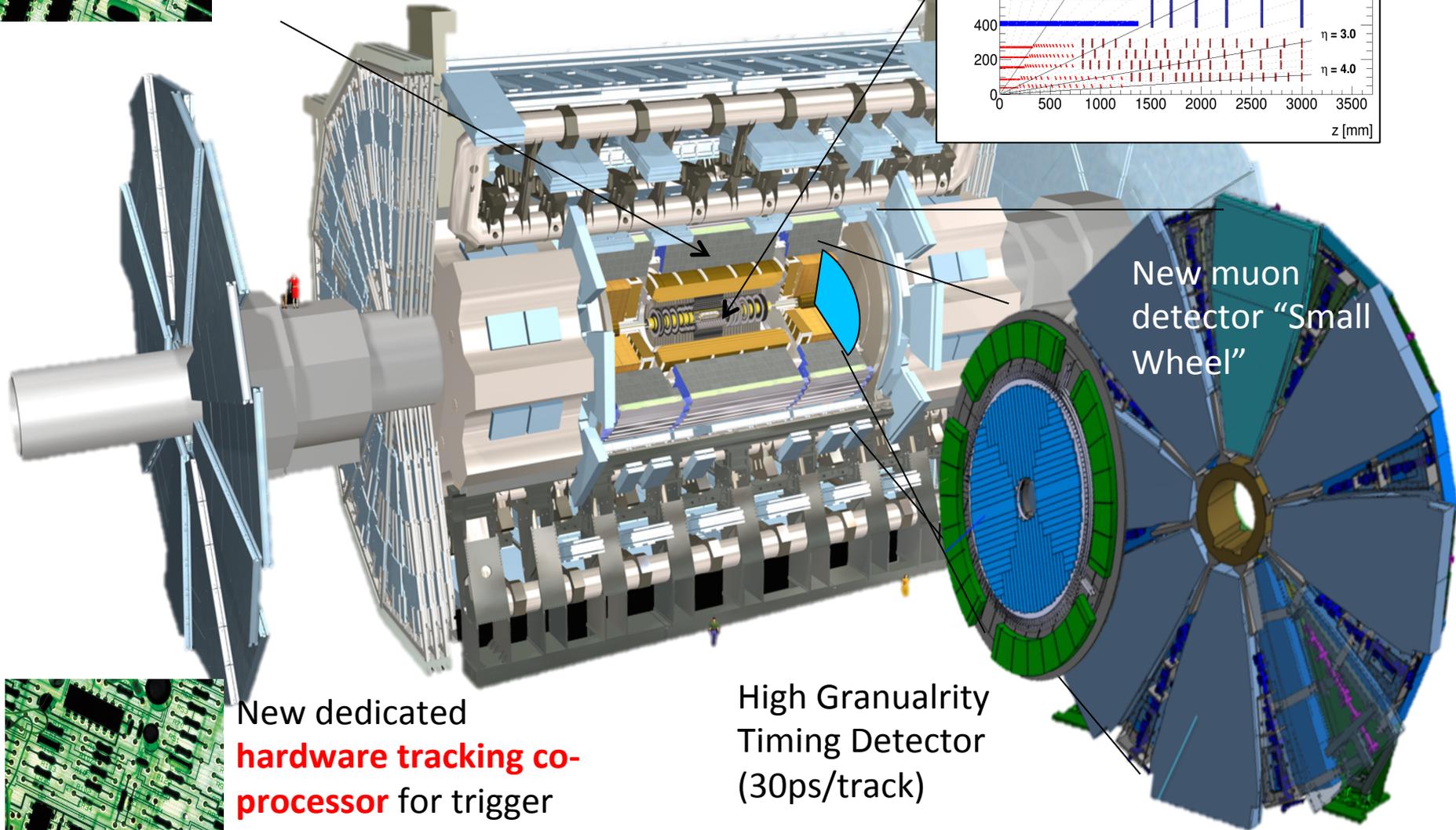
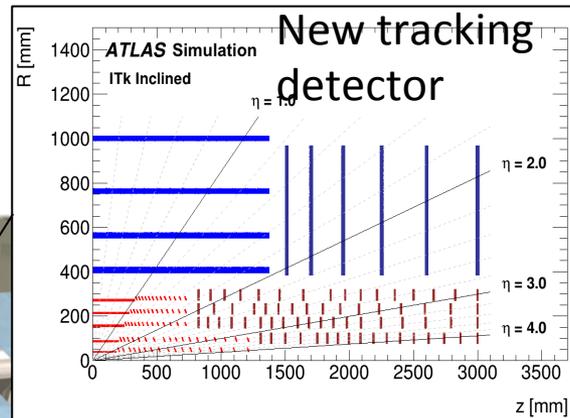
Investigação no DF - 19/11/2019

Investigadora no CERN

(*) sublinhar a opção correta



Calorimeter: new DAQ electronics, **HV sources** and gap scintillators



New muon detector "Small Wheel"

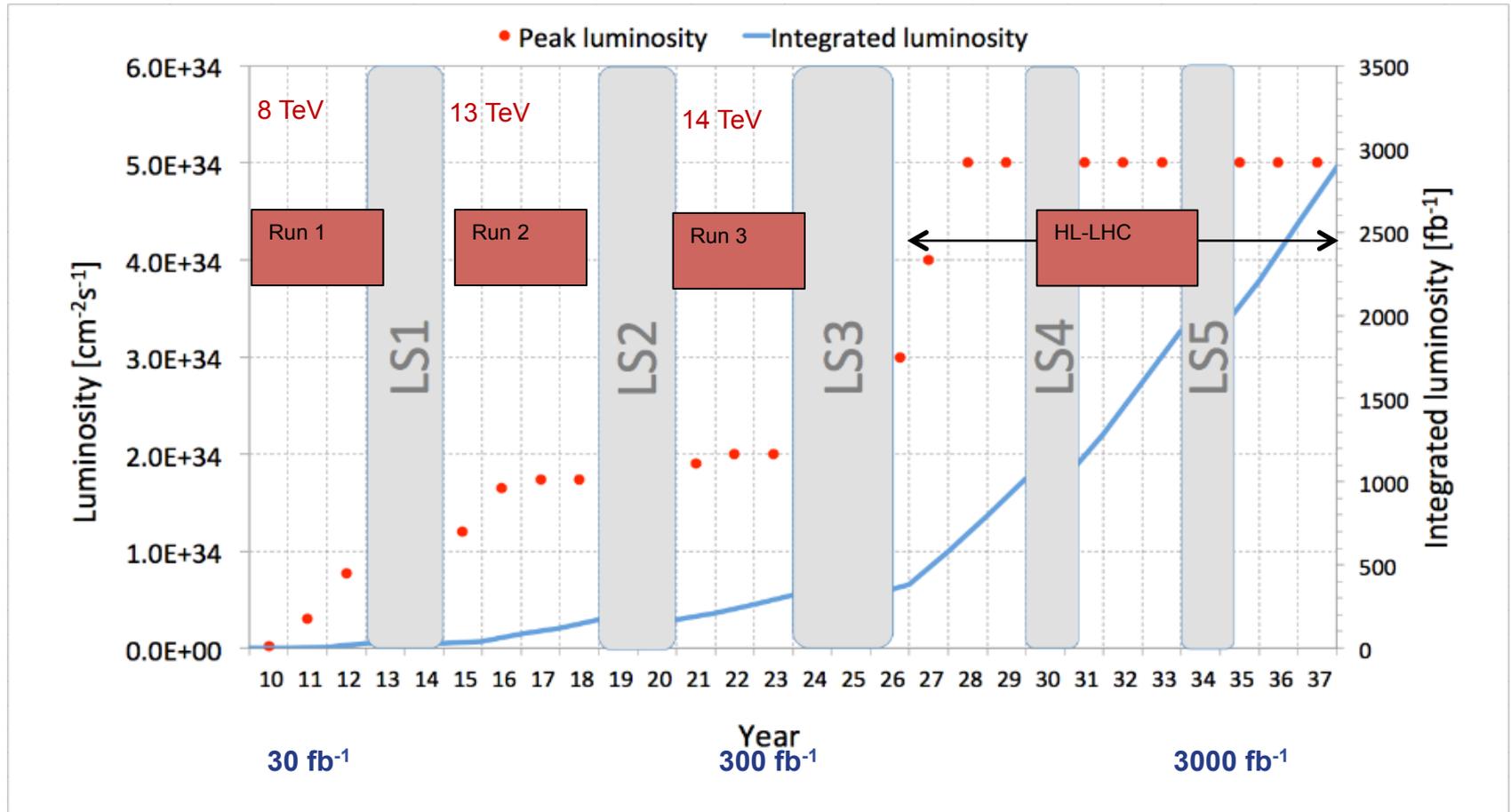
High Granularity Timing Detector (30ps/track)

New dedicated **hardware tracking co-processor** for trigger



High Luminosity LHC – HL-LHC

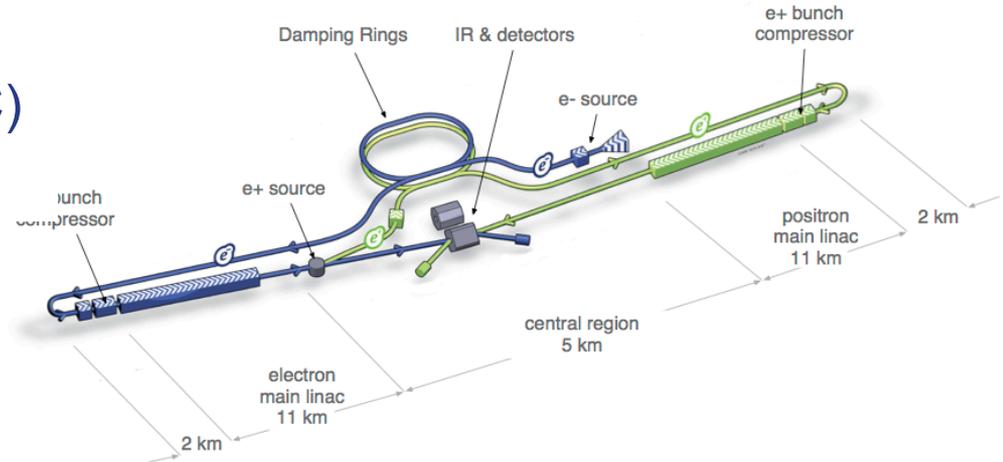
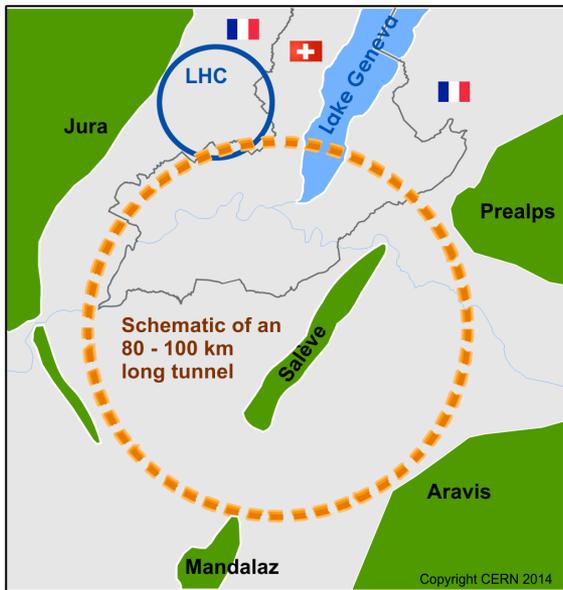
O Poder da precisão



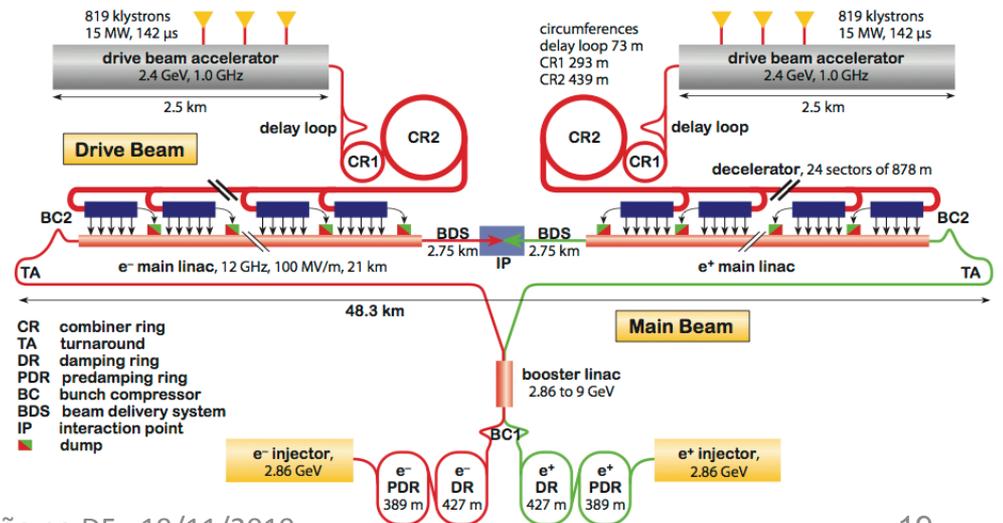
Futuros aceleradores?

International Linear Collider (ILC)

- 0.5 TeV machine; 31 km



Future Circular Collider: 100 km e+e- (350 GeV) e mais tarde p-p (100 TeV)



Compact Linear Collider (CLIC)

- 3 TeV collider - 50 km