

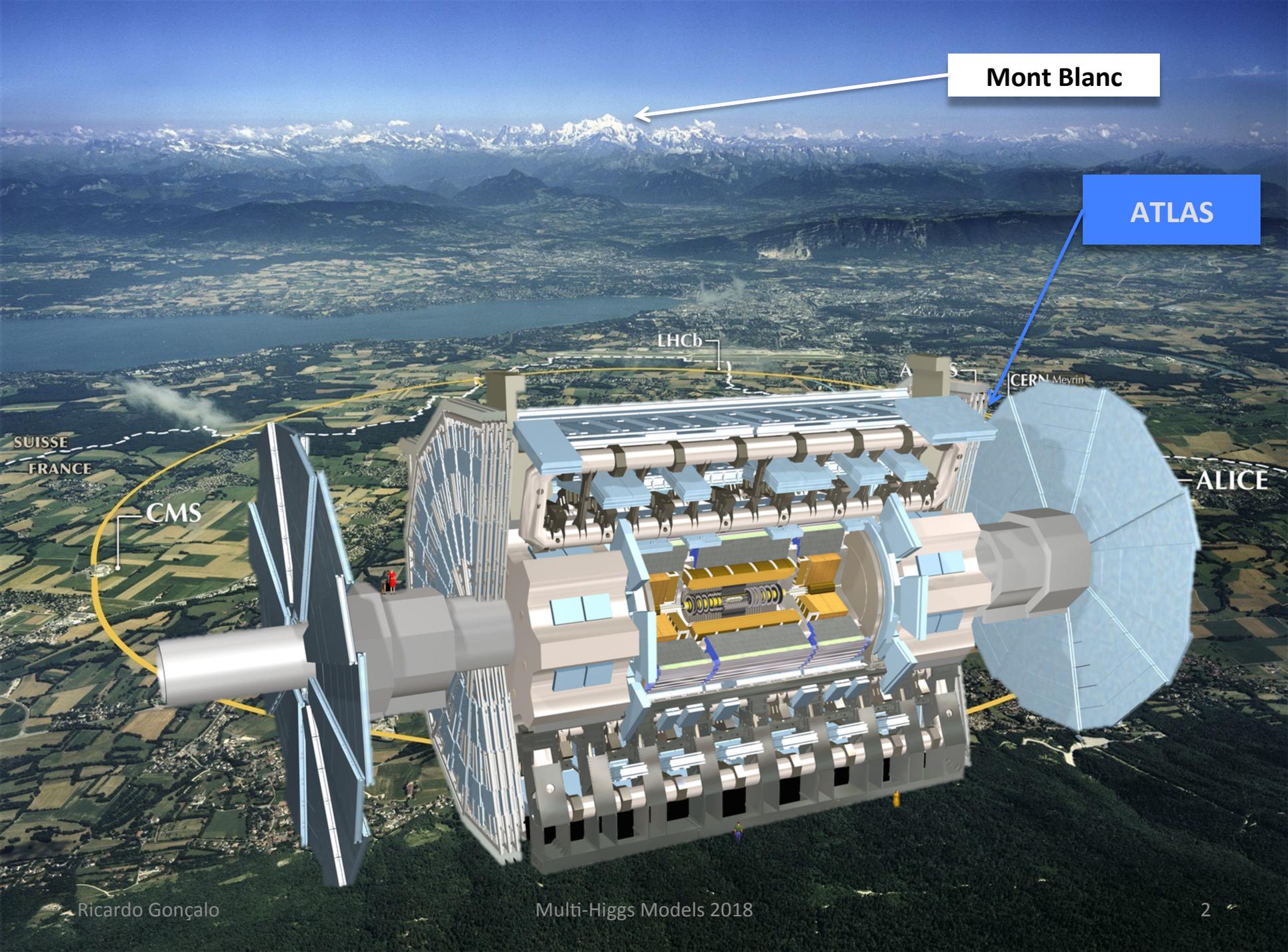
# Investigação na Experiência ATLAS



Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Cofinanciado por:





Mont Blanc

ATLAS

LHCb

CERN Meyrin

SUISSE  
FRANCE

CMS

ALICE



## 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"

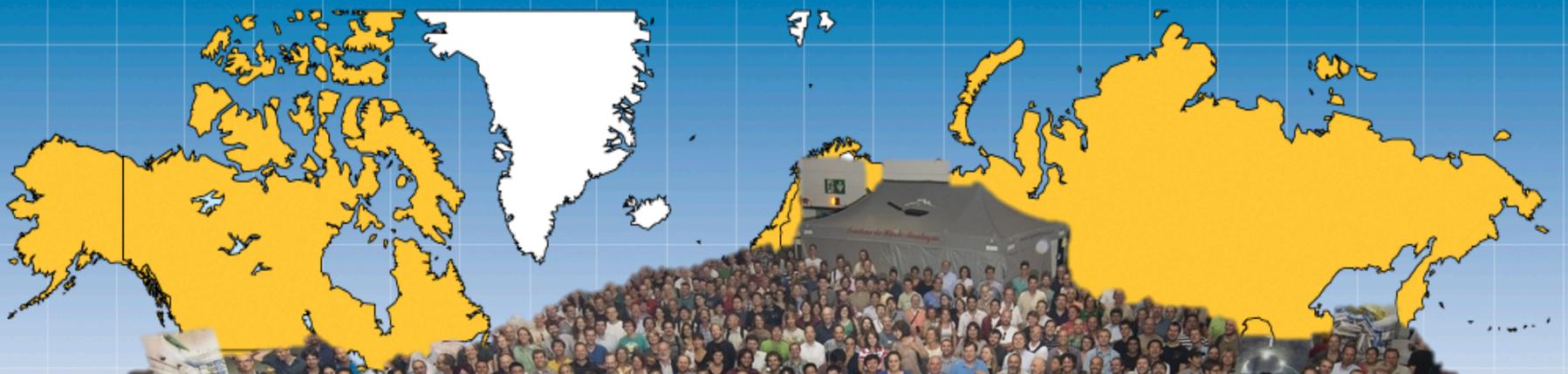
**Weight:** 215 lbs.

**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



- Argentina
- Armenia
- Australia
- Austria
- Azerbaijan
- Belarus
- Brazil
- Canada
- Chile
- China
- Colombia
- Czech Republic
- Denmark
- France
- Georgia
- Germany
- Greece
- Israel
- Italy
- Japan
- Romania
- Russia
- Serbia
- Slovakia
- Slovenia
- South Africa
- Spain
- Sweden
- Switzerland
- Taiwan
- Turkey
- UK
- USA
- CERN
- JINR



# ATLAS Collaboration



**Muon Spectrometer:**  $|\eta| < 2.7$

Air-core toroid + gas-based muon chambers

$\sigma/p_T = 2\% @ 50\text{GeV}$  to  $10\% @ 1\text{TeV}$  (ID+MS)

**EM calorimeter:**  $|\eta| < 2.5$  (3.2)

Pb-LAr accordion sampling

$\sigma/E = 10\%/\sqrt{E} \oplus 0.7\%$

**Solenoid:**  $B = 2\text{ T}$

**Inner Tracker:**  $|\eta| < 2.5$

Si pixels/strips and Trans. Rad. Det.

$\sigma/p_T = 0.05\% p_T (\text{GeV}) \oplus 1\%$

**Hadronic calorimeter:**

Fe/scintillator / Cu/W-LAr

$\sigma/E_{\text{jet}} = 50\%/\sqrt{E} \oplus 3\%$



**SIF HC** spa  
PROGETTAZIONI  
IMPIANTI  
COSTRUZIONE MONTAGGIO  
INDUSTRIALI  
Via Vittorio Veneto, 120/2  
37139 VERONA (Italia)  
Tel. 0474.906.611

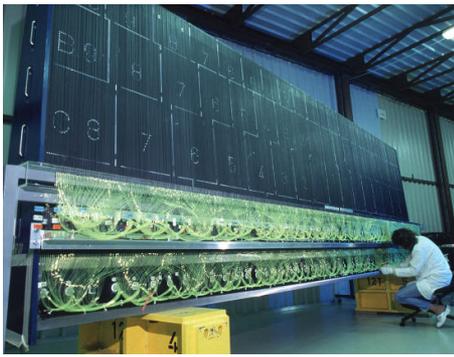
# Etapas do projecto Tilecal (1993-2009)



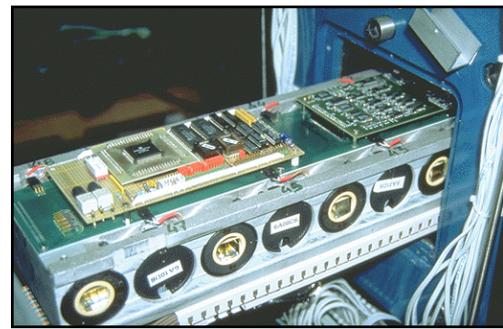
1993-1995 R&D-protótipos



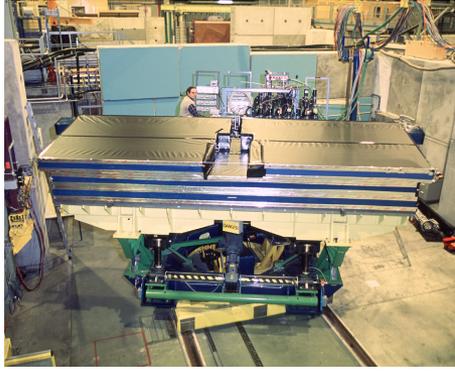
1996-2002:construção



1999-2002 Instrumentação



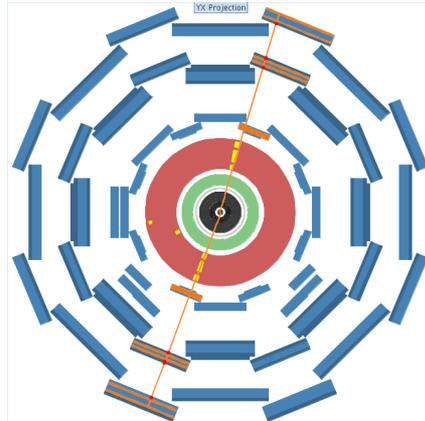
1999-2004: Electrónica



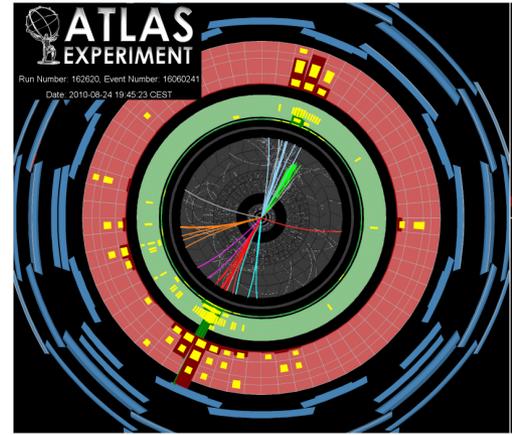
2002-2004: calibrações



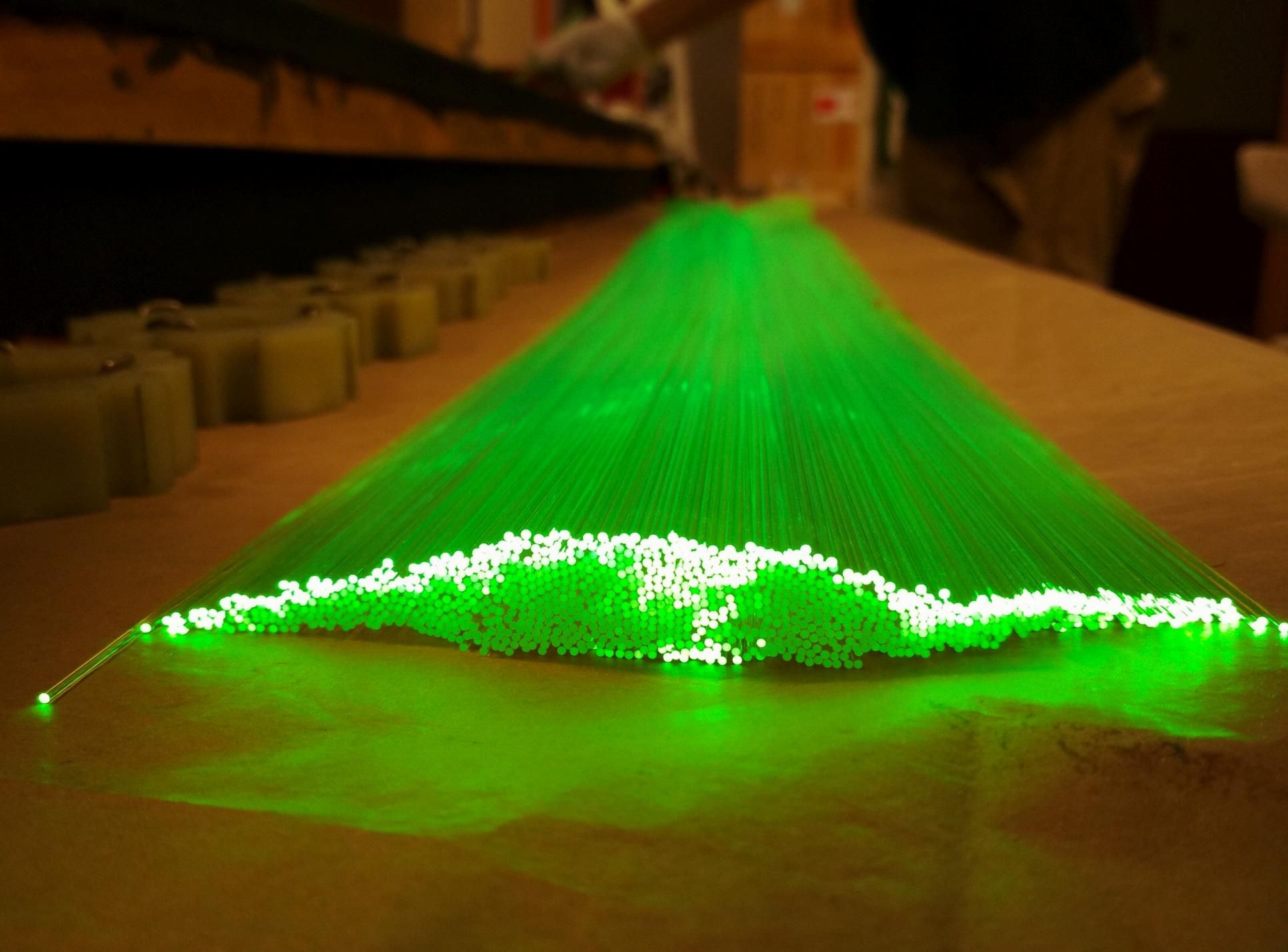
2004-2006 Instalação



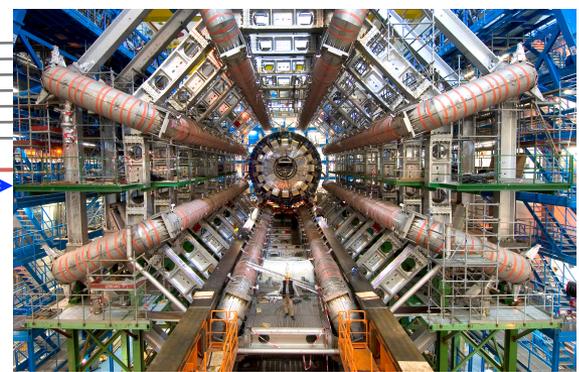
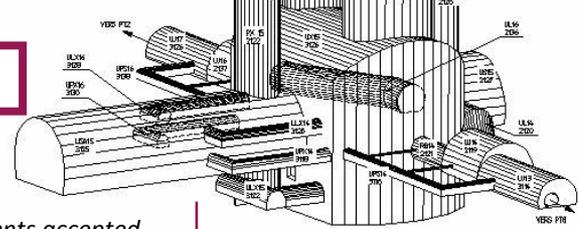
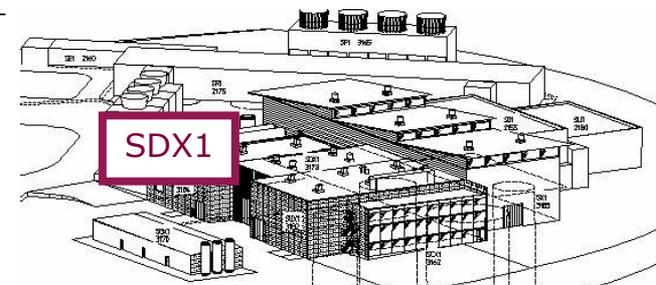
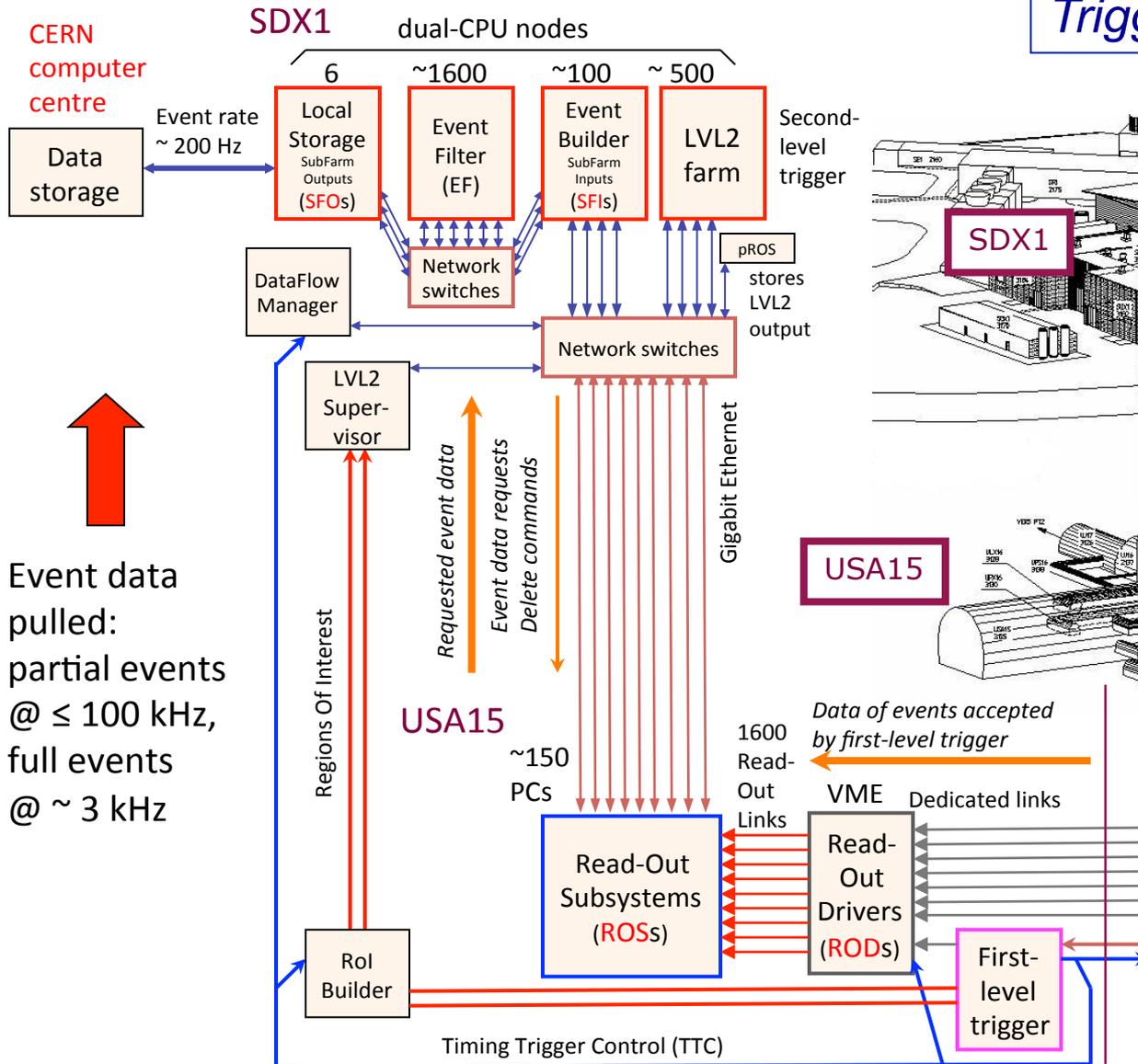
2007-2009 certificação  
(raios cósmicos)



2009-->: aquisição/análise  
dados LHC

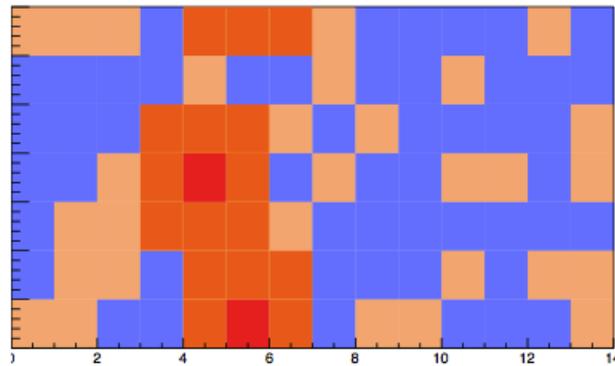
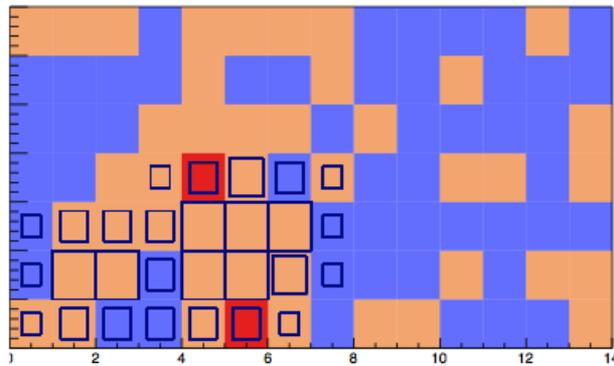
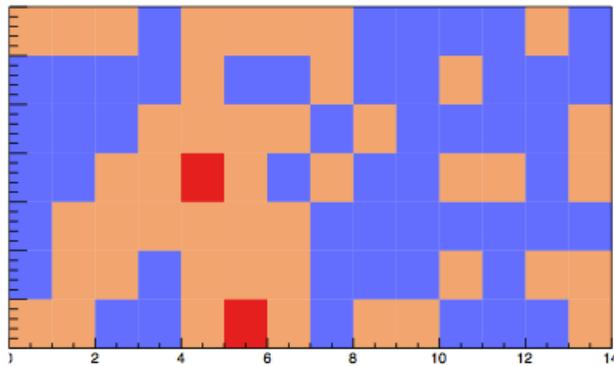
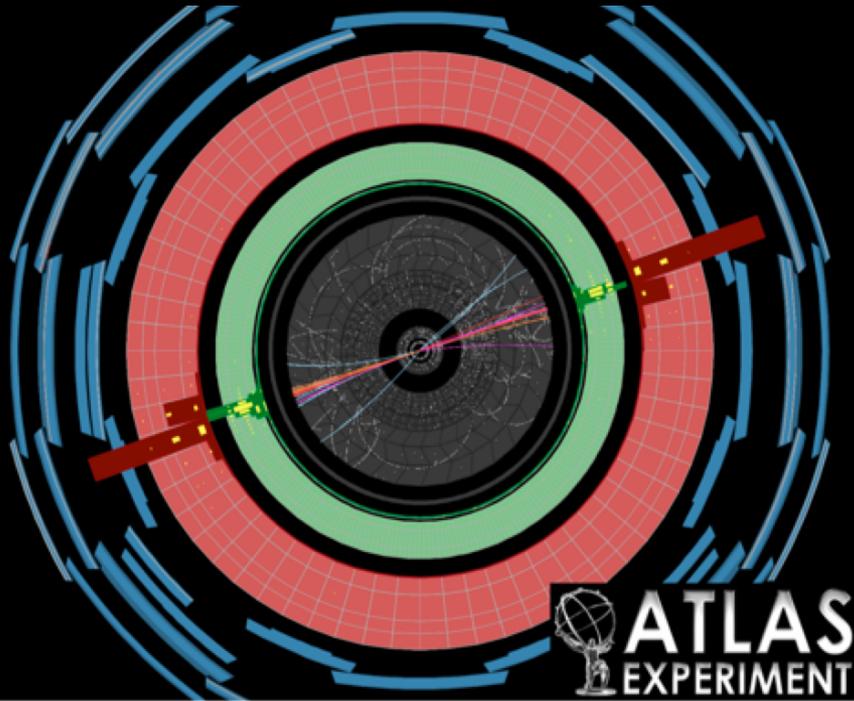


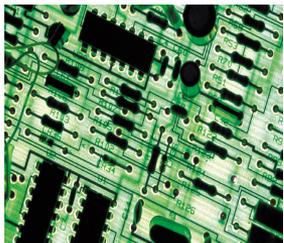
# Trigger / DAQ architecture



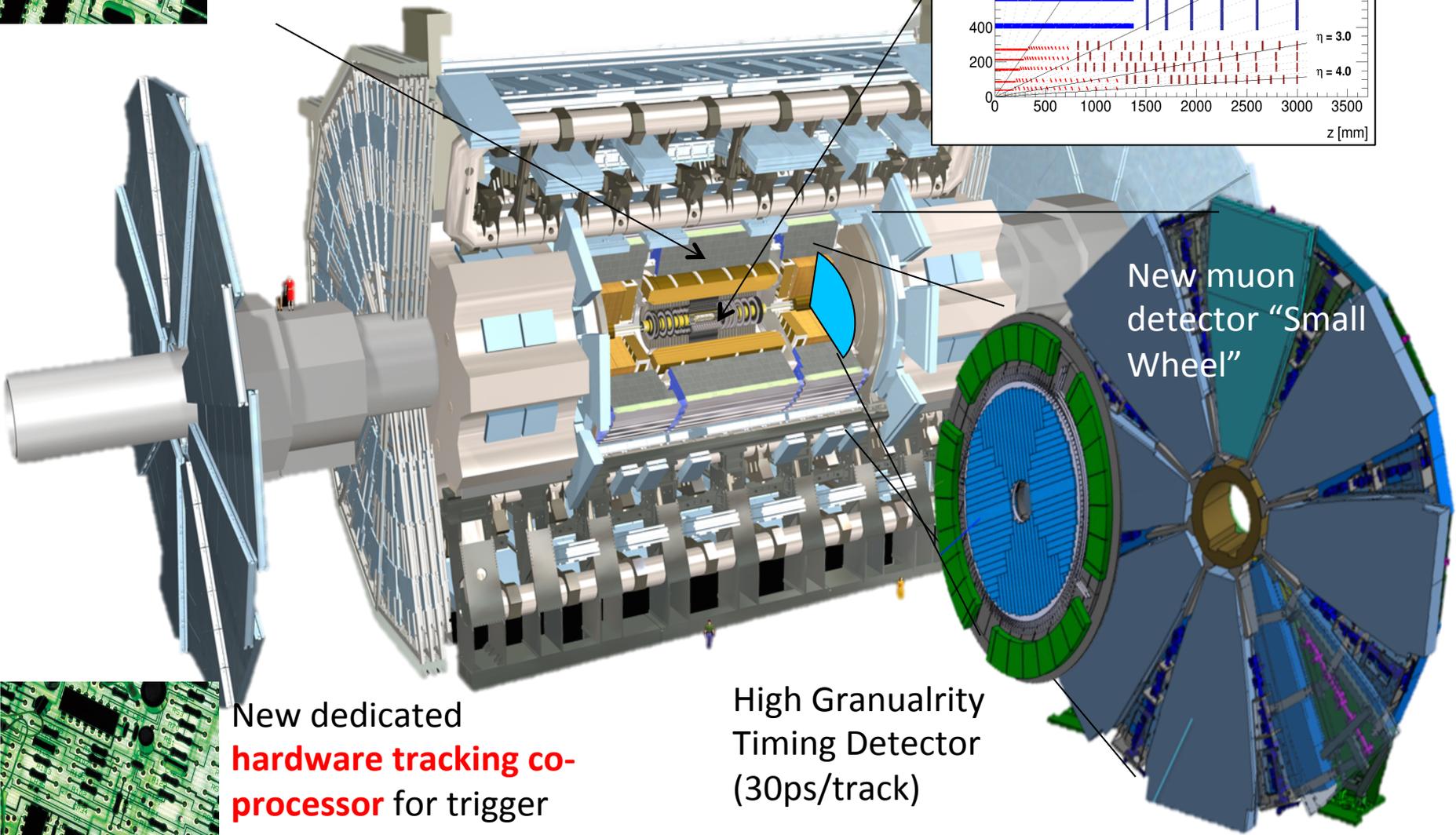
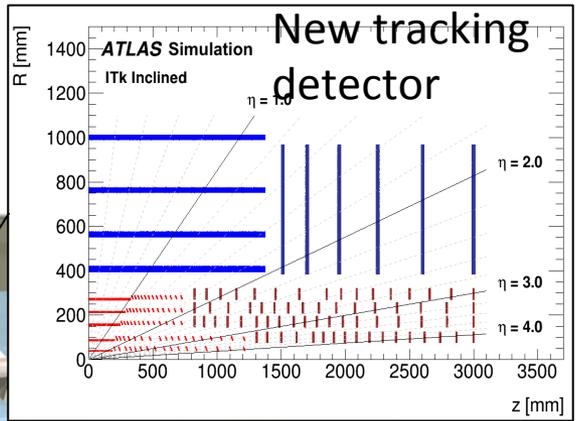
Event data pulled:  
partial events @  $\leq 100$  kHz,  
full events @  $\sim 3$  kHz

Event data pushed @  $\leq 100$  kHz,  
1600 fragments of  $\sim 1$  kByte each





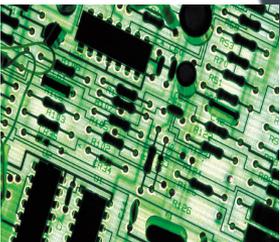
Calorimeter: new DAQ electronics, **HV sources** and gap scintillators

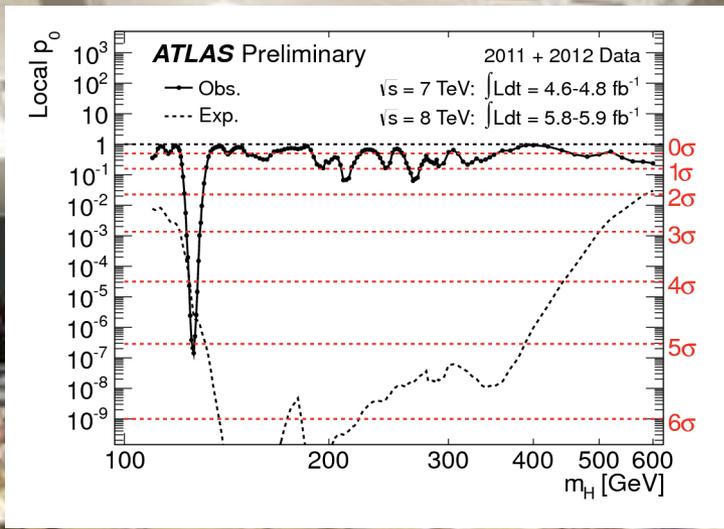


New muon detector "Small Wheel"

High Granularity Timing Detector (30ps/track)

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



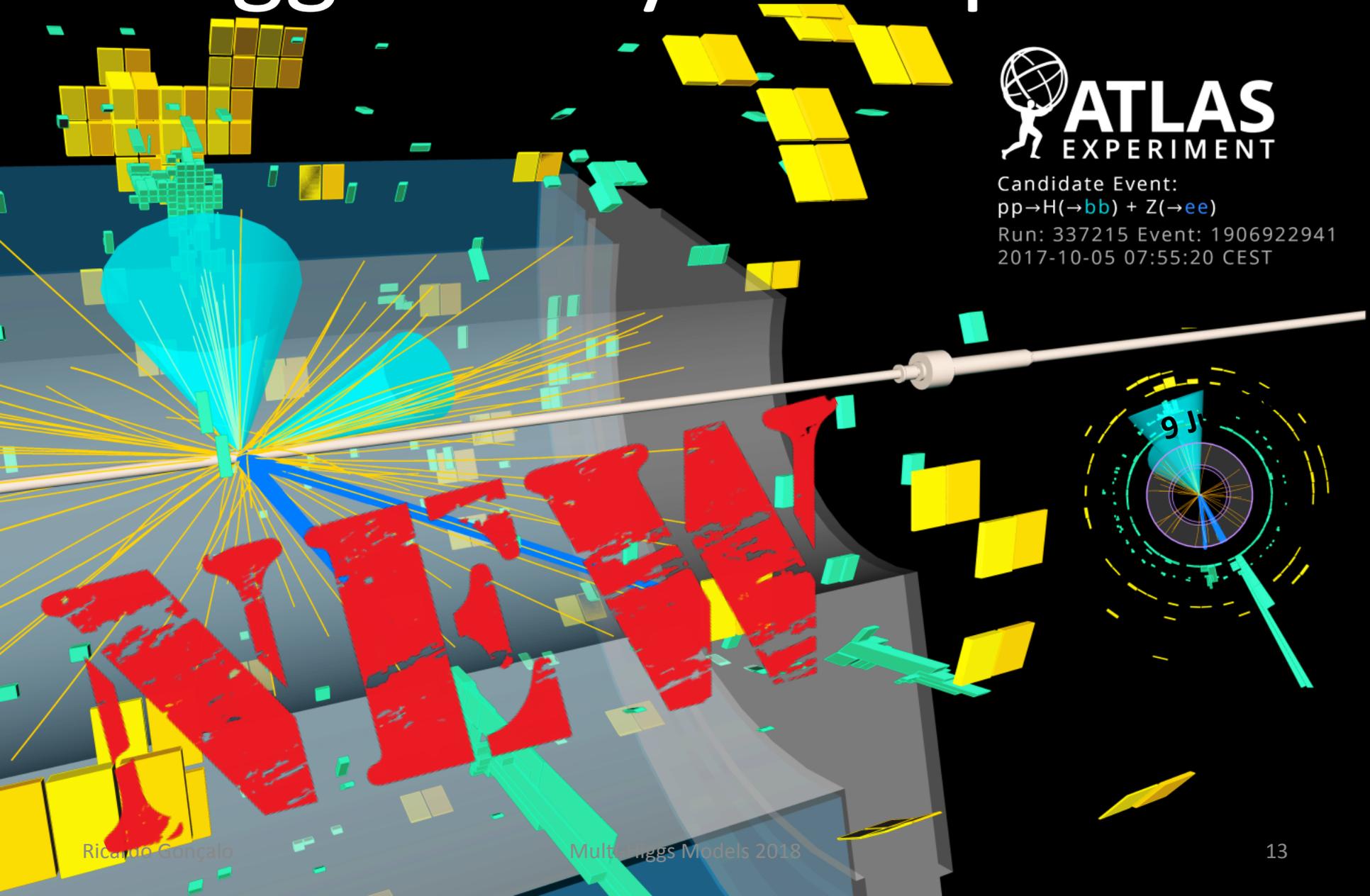


# The Run 1 legacy

# Higgs decay to b-quarks



Candidate Event:  
 $pp \rightarrow H(\rightarrow bb) + Z(\rightarrow ee)$   
Run: 337215 Event: 1906922941  
2017-10-05 07:55:20 CEST



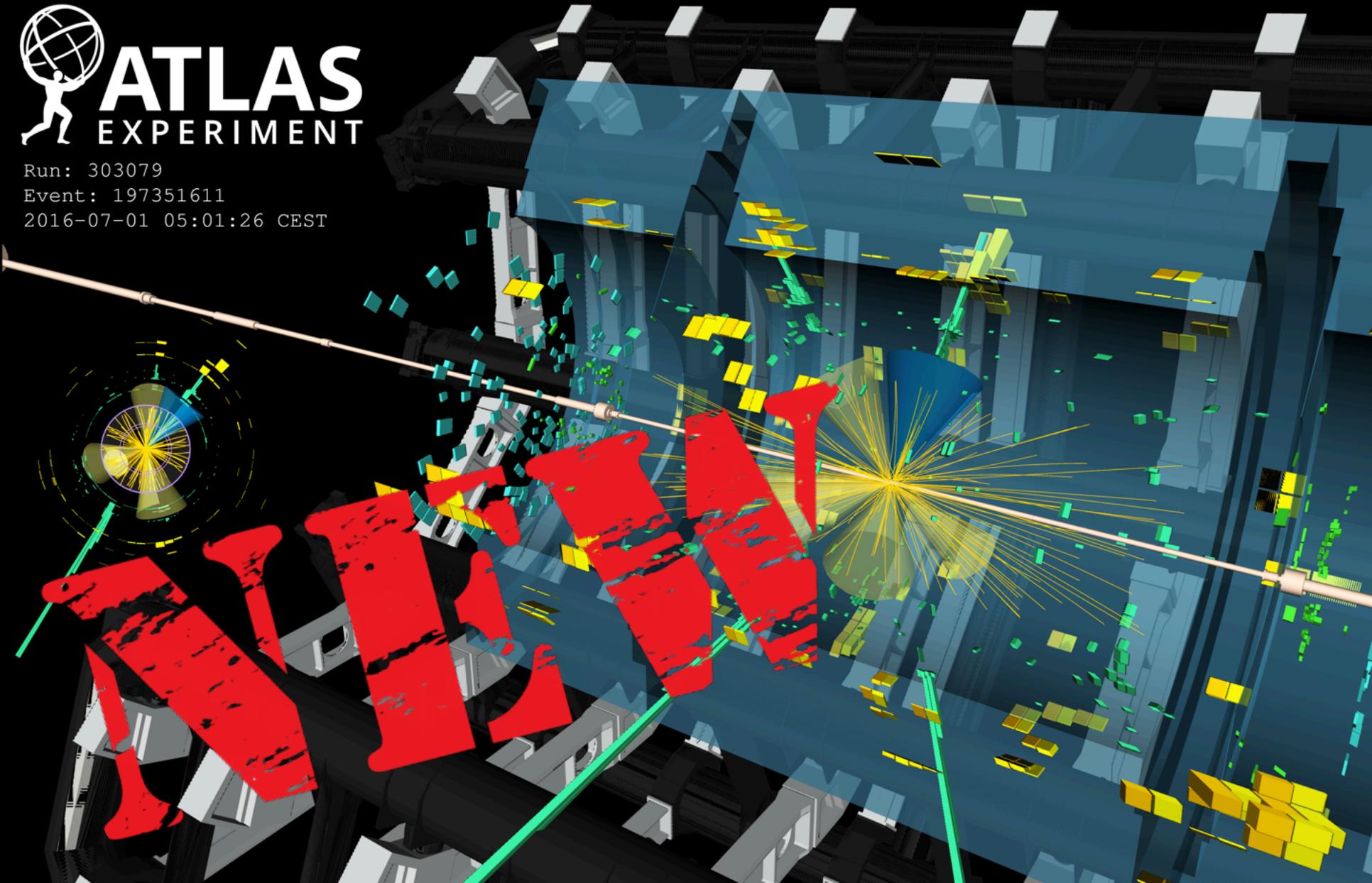
# Higgs production with top quarks



Run: 303079

Event: 197351611

2016-07-01 05:01:26 CEST



# Probing the 125 GeV Higgs



# Angular distributions in $t\bar{t}H(H \rightarrow b\bar{b})$ reconstructed events at the LHC

S.P. Amor dos Santos<sup>1</sup>, J.P. Araque<sup>2</sup>, R. Cantrill<sup>3</sup>, N.F. Castro<sup>2,9</sup>, M.C.N. Fiolhais<sup>1,4</sup>,  
 R. Frederix<sup>5</sup>, R. Gonçalo<sup>3</sup>, R. Martins<sup>2</sup>, R. Santos<sup>7,8</sup>, J. Silva<sup>6</sup>, A. Onofre<sup>2</sup>, H. Peixoto<sup>6</sup>, A. Reigoto<sup>2</sup>

<sup>1</sup> LIP, Departamento de Física, Universidade de Coimbra, 3004-516 Coimbra, Portugal

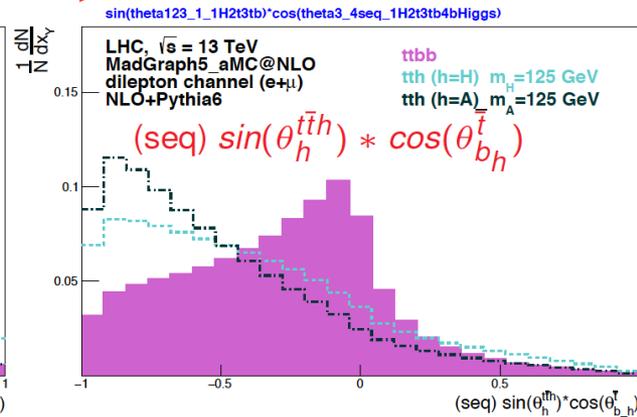
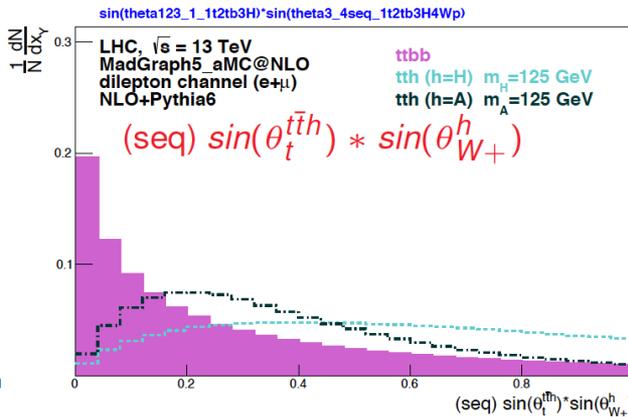
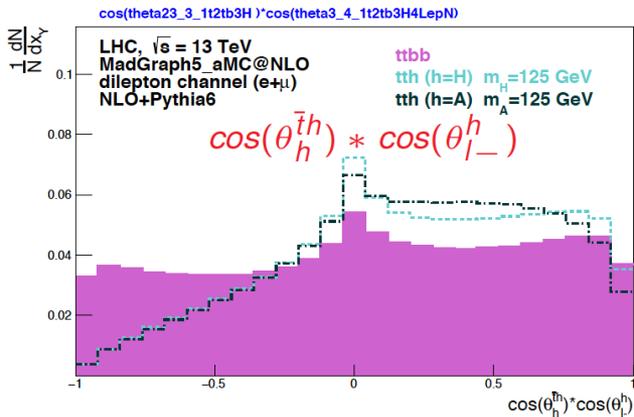
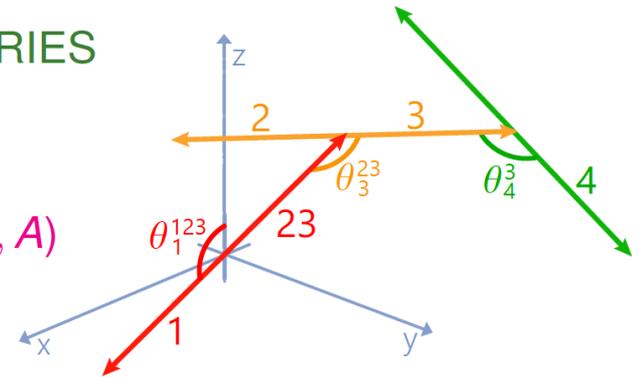
<sup>2</sup> LIP, Departamento de Física, Universidade do Minho, 4710-057 Braga, Portugal

## NEW ANGULAR DISTRIBUTIONS AND ASYMMETRIES

👉 (1) PARTON LEVEL observables NO CUTS

motivated by spin helicity formalism

are there good discriminators to separate signals ( $H, A$ )  
 from dominant backgrounds? Yes!



A large group of approximately 30 people, including men and women of various ages, are posing for a group photo in front of the ATLAS detector. The detector is a massive, complex structure with a central circular opening and numerous pipes and cables. The people are dressed in casual to semi-formal attire, including jackets, sweaters, and scarves. The background shows the intricate details of the detector's interior, with various components and structures visible.

<https://www.lip.pt/atlas/>  
[atlasinfo@lip.pt](mailto:atlasinfo@lip.pt)

