The ATLAS experiment

Agostinho Gomes
(LIP and FCUL)
on behalf of the portuguese ATLAS team

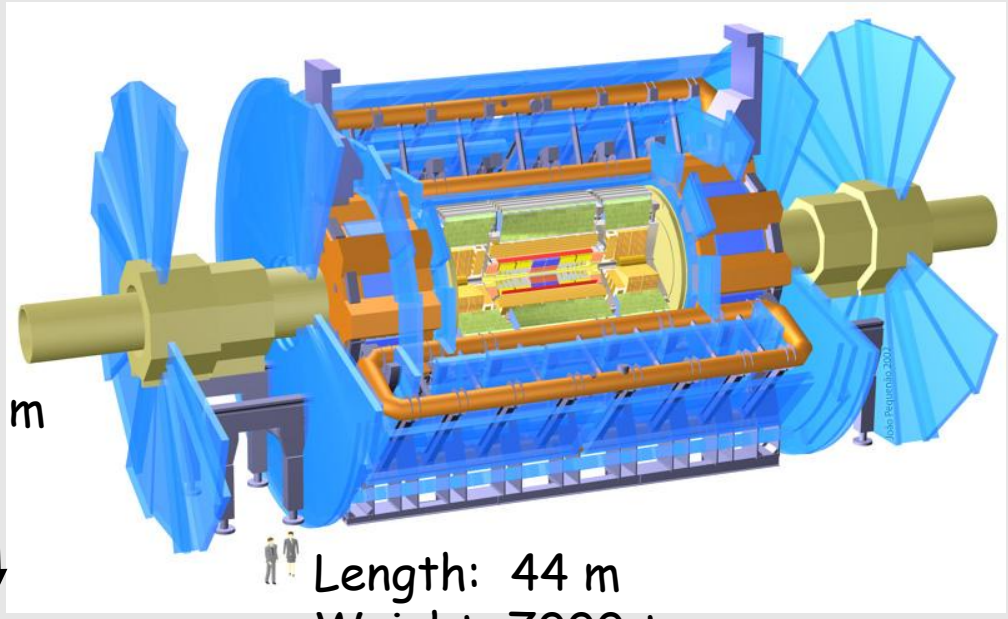
Jornadas do LIP Lisboa 21 March 2012

The ATLAS detector

The ATLAS detector operates at the CERN Large Hadron Collider (LHC):
p-p collisions at 8 TeV
Pb-Pb collisions

Main goals:
Probe the Standard Model and beyond at the TeV scale

LHC



Length: 44 m
Weight: 7000 tons
Electronic channels: ~100 milions

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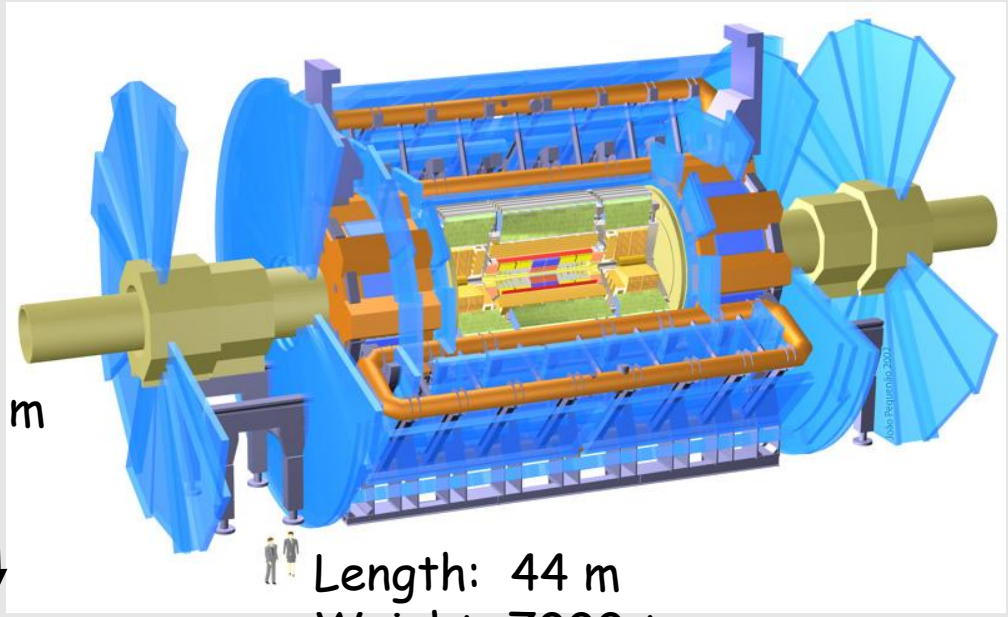
Peter Higgs visiting ATLAS

LHC



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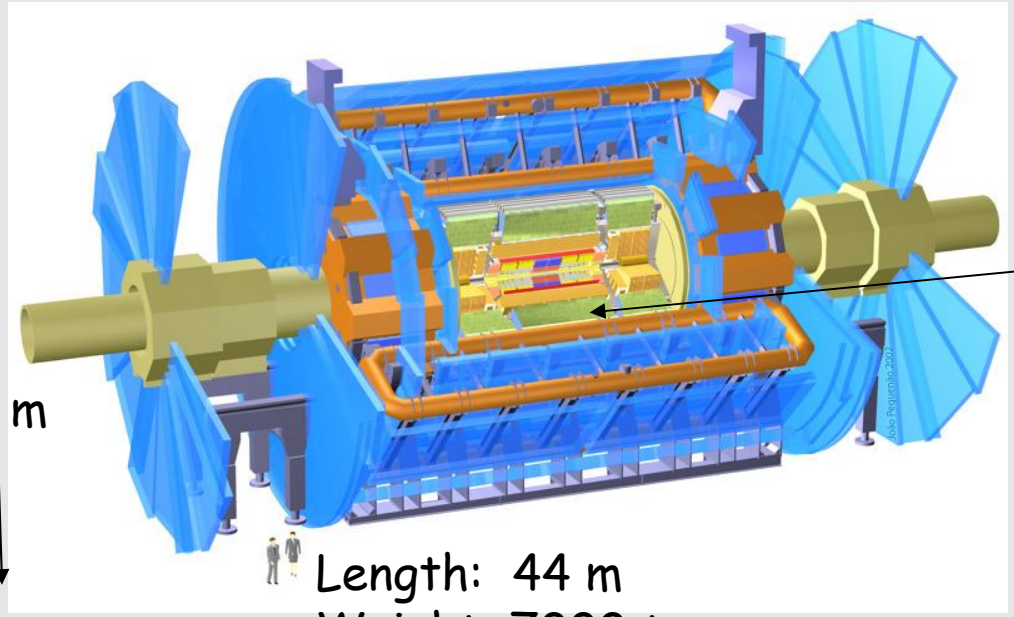

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We participate since the beginning of ATLAS (LoI, 1992)

Design and construction of Tilecal

ALFA luminosity detector

Trigger/Data Acquisition
- database interface developments
- jet energy calibration

Physics
- top quark properties
- search for the Higgs boson

People and Institutions

LIP in collaboration with:

FCUL

FCTUC

U. Minho

CFNUL

CEFITEC/UNL

IDMEC/IST

AdI engineers training program

Researchers

A. Amorim, N. Anjos, J. Augusto, J. Carvalho, N. Castro, P. Conde Muiño, G. Evans, A. Gomes, **A. Maio**, J. Maneira, M. Maneira, M. Oliveira, A. Onofre, B. Pinto, H.Santos, J.G. Saraiva, F. Veloso, H. Wolters

Students

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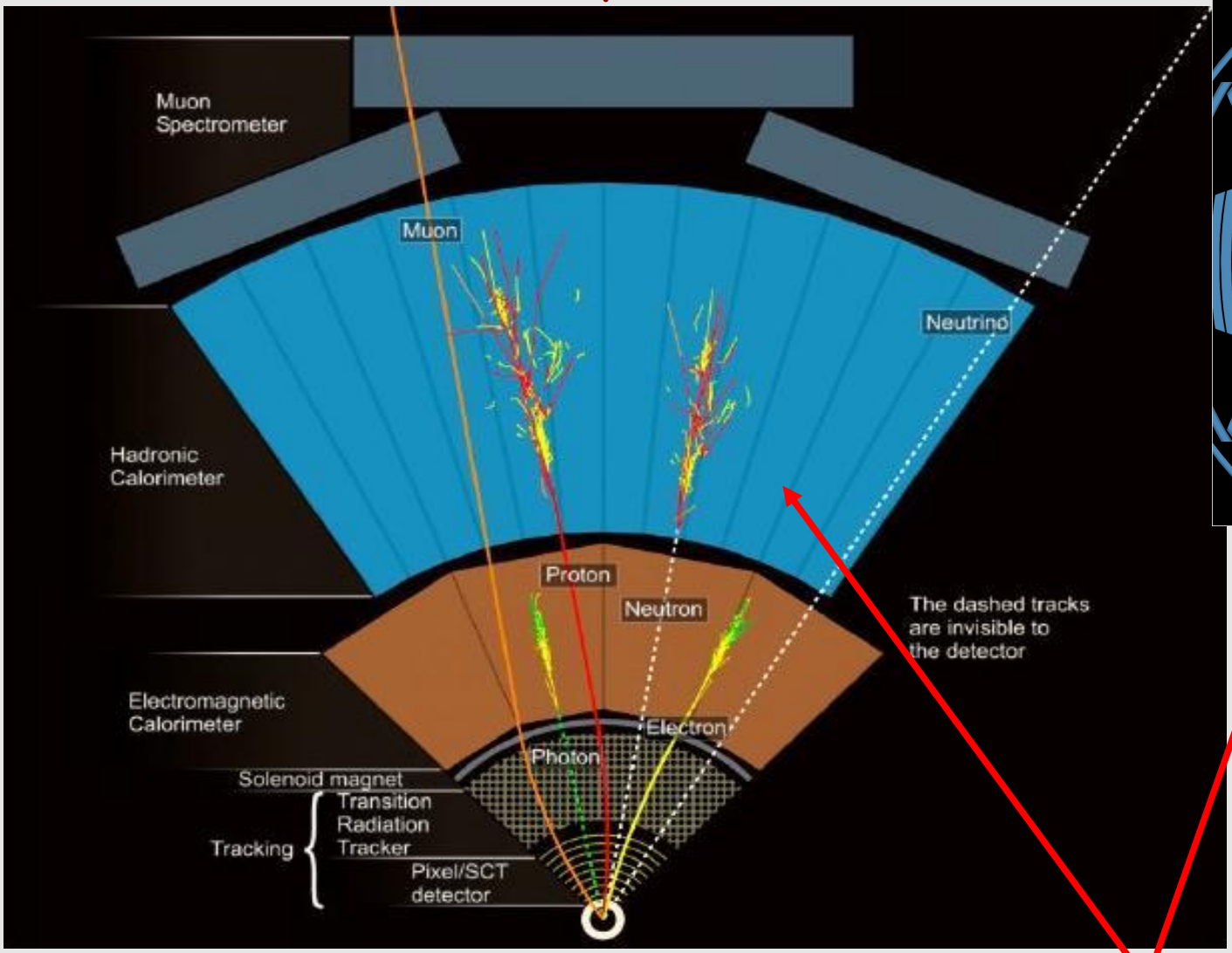
Other staff

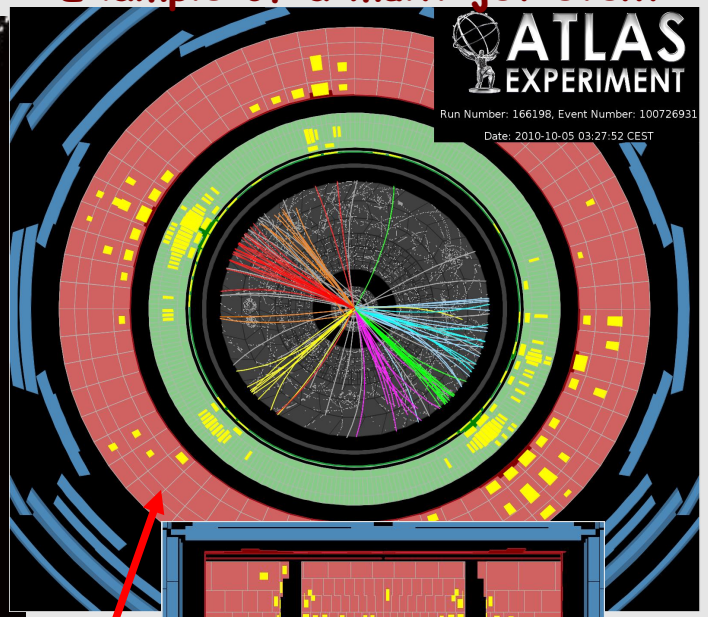
L. Gurriana, J. Patriarca, J. Silva

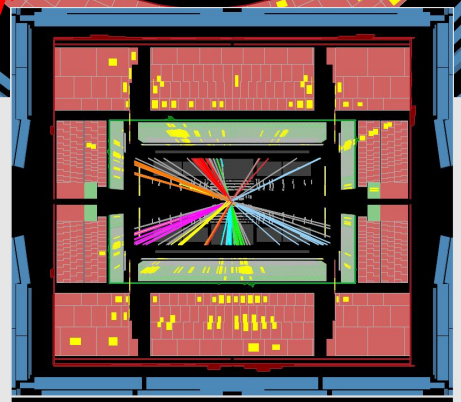
Hadrons, jets and Tilecal

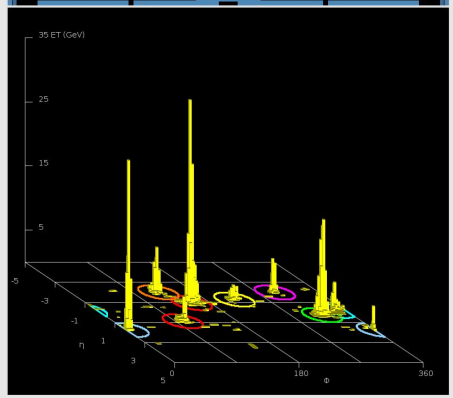
How we detect particles



Example of a multi-jet event

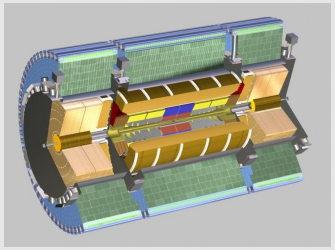




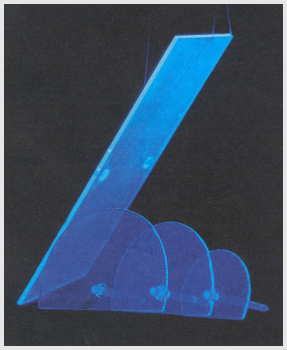


Hadronic calorimeter (Tilecal)

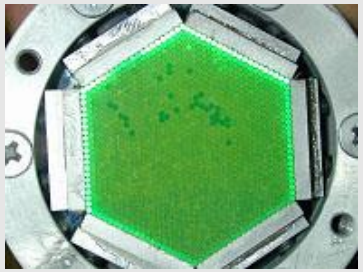
Design and production of Tilecal
hadron calorimeter



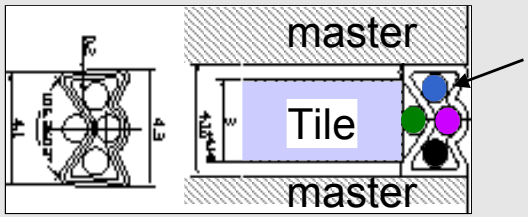
Scintillators



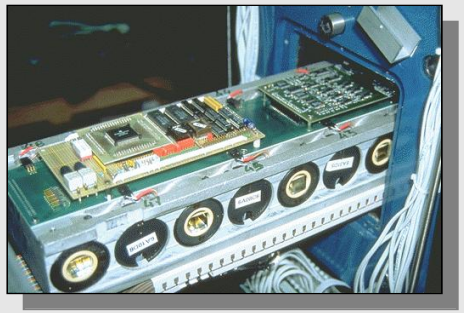
600000 WLS fibers aluminized



150000 plastic profiles

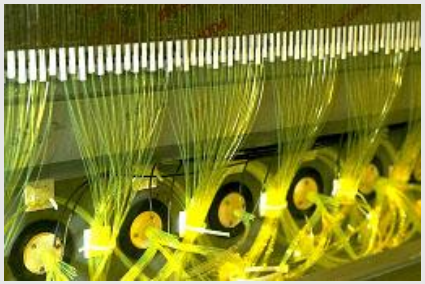


PMT blocks supports



Laser monitoring system: connectors, fibers, beam expander

Design of the cells and fibers routing

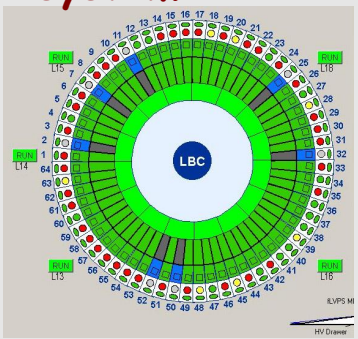


Fibers insertion with robot

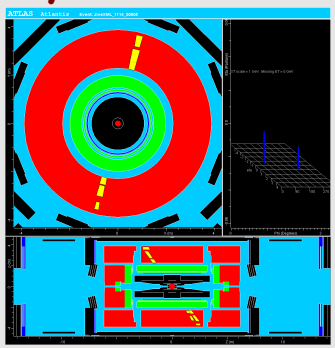
PMT quality control

Instrumentation of the modules

Detector control system

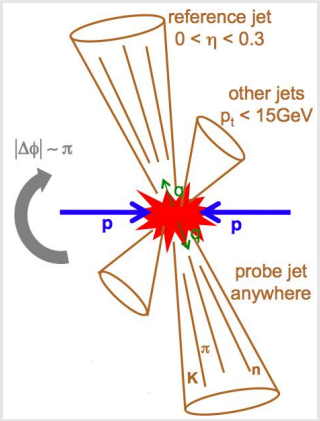


Calibration, certification and commissioning with testbeam and cosmic rays



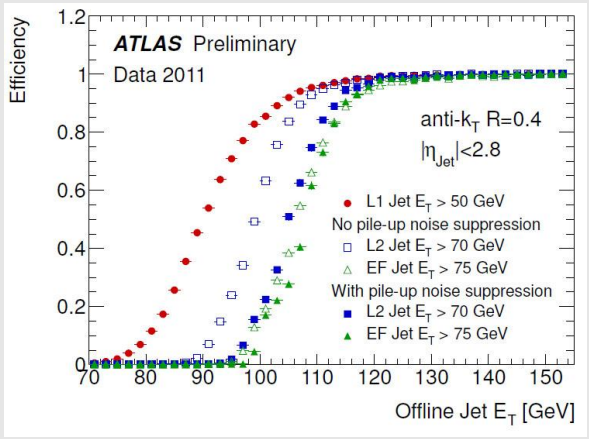
Trigger performance, ALFA and safety

Trigger: jet calibration



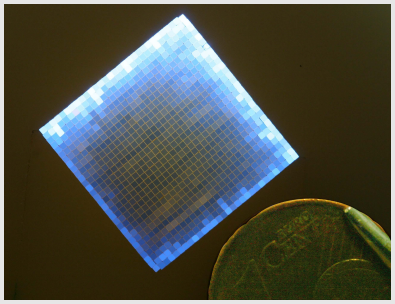
Validation of calibration

Determination of jet energy scale using E/p



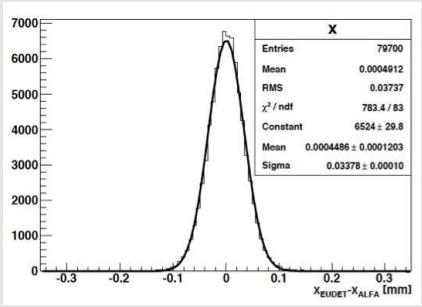
Efficiency of jet trigger

ALFA detector – to measure the absolute luminosity



0.5mm square fibers

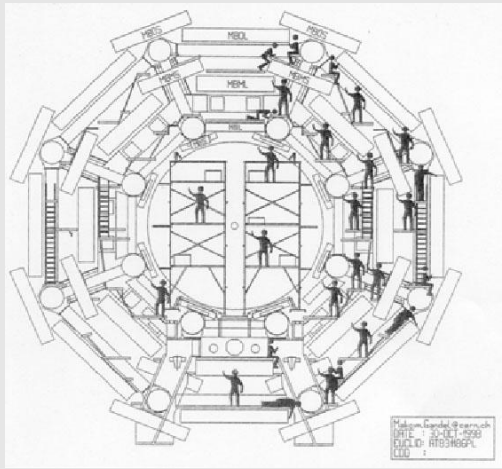
Prototype at testbeam



Track resolution

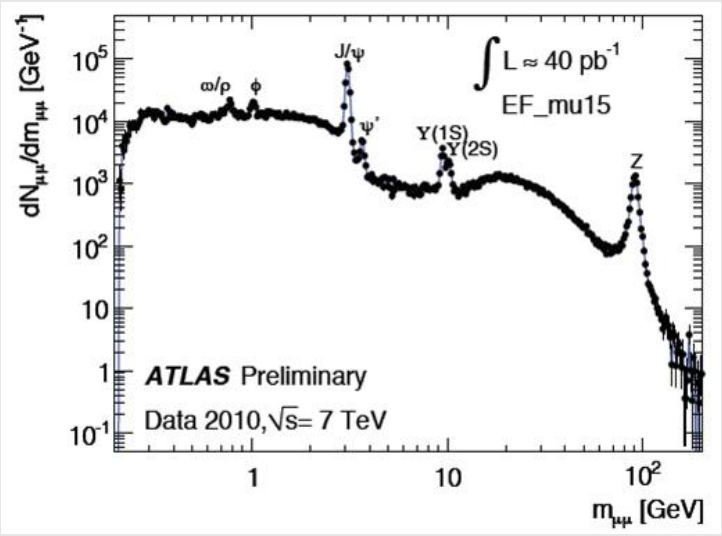
Safety inside ATLAS

tool to monitor people inside detector during short accesses

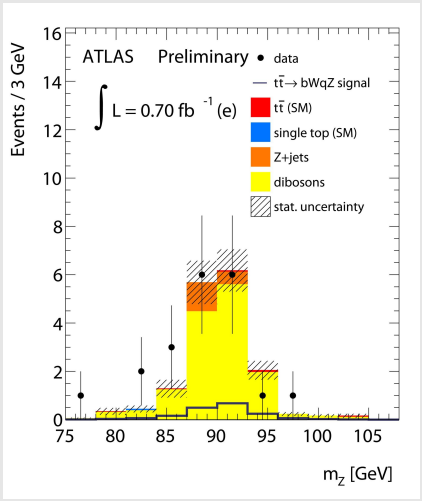


Physics analysis

Good old physics found at the right place

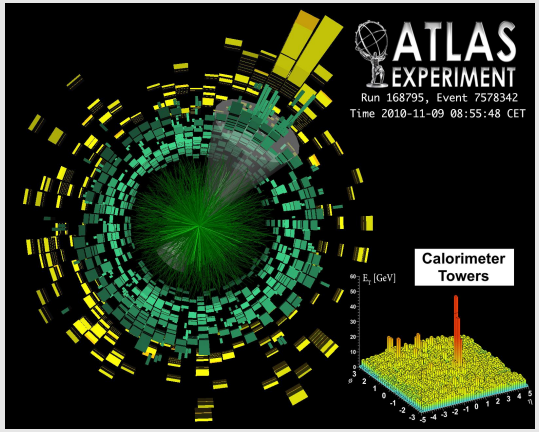


Top quark properties – rare decays



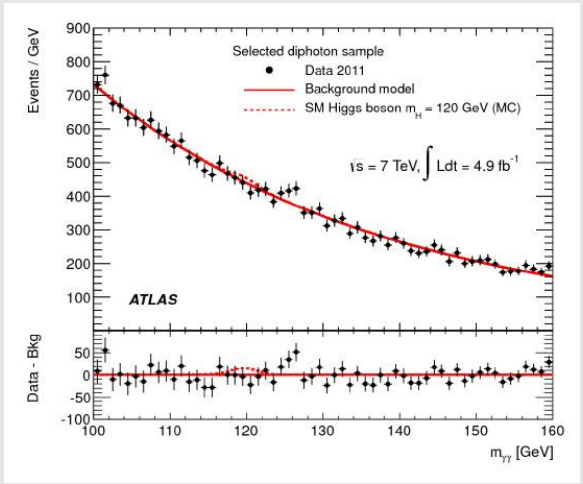
mZ for t → qZ (electrons)

Jet suppression in heavy ion collisions

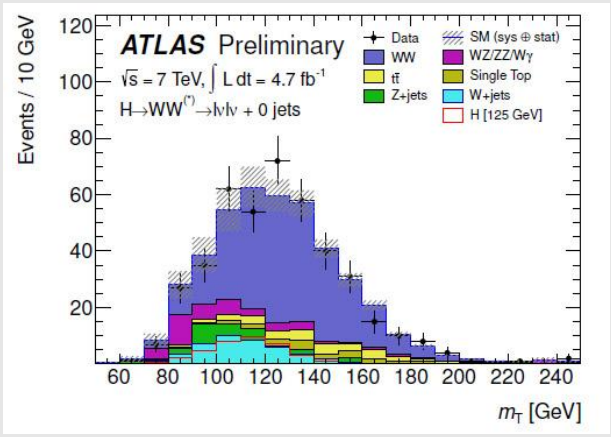


Searching for the Higgs boson

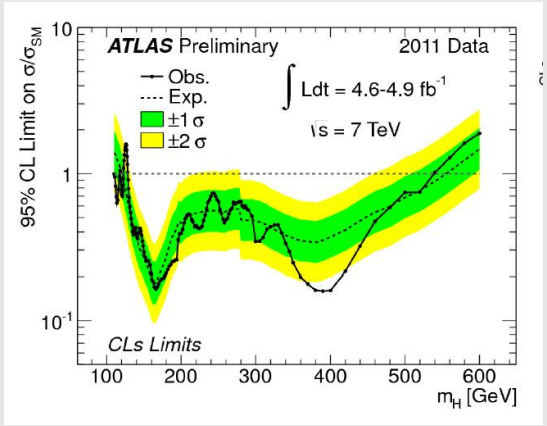
$H \to \gamma\gamma$



$H \to WW \to l\nu l\nu$



All channels combined



Higgs mass range excluded at 99% CL: 130-486 GeV