

# **Celebration of the discovery of the Higgs boson Anniversary from Africa**

**July 4<sup>th</sup> , 2022**

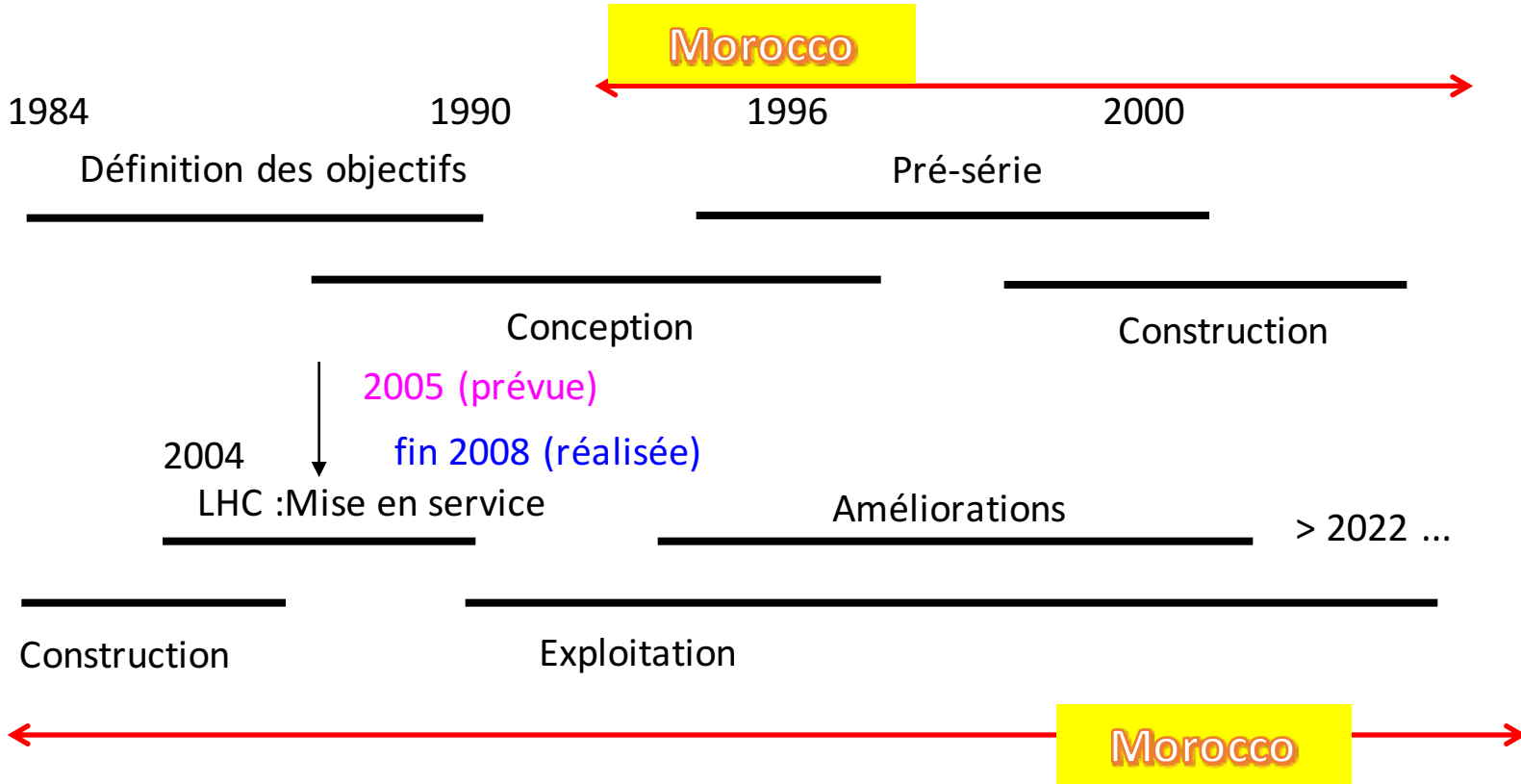
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# Les phases du projet ATLAS



# Morocco : High Energy Physics History



Le nucléaire au service du développement

- Active community in high energy physics theory, Mathematical Physics and cosmology
  - Tight collaborations with **ICTP – Trieste-** and some **IN2P3** laboratories
- No official participation of Morocco in experimental high energy physics programs
- In the middle of 1990's formal collaboration with IN2P3 and CERN
  - In 1996 first Collaboration agreement of CERN with an Arabe and African country
- First participation of Morocco in the construction of a major international scientific instrument
- First structuration of research in Moroccan Universities especially by the creation of National Thematic Networks like National High Energy Physics Network (1996)
- Construction of the presampler of the ATLAS Electromagnetic Calorimeter with
  - LPSC – Grenoble – FRANCE & KTH – Stokholm - SWEDEN

# Reseau Universitaire de Physique des Hautes Energies (RUPHE)

Moroccan High Energy Physics Cluster

- **Founded in 1996 :**

- University of Casablanca
- University of Rabat
- University of Oujda
- University of Marrakech
- University Of Tanger
- CNESTEN – Rabat

**20 Professors**  
**20 Students**

- **WEB site <http://ruphe.fsac.ac.ma/>**

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- **Funding Agency :** Centre National de La Recherche Scientifique et technique (**CNRST**)

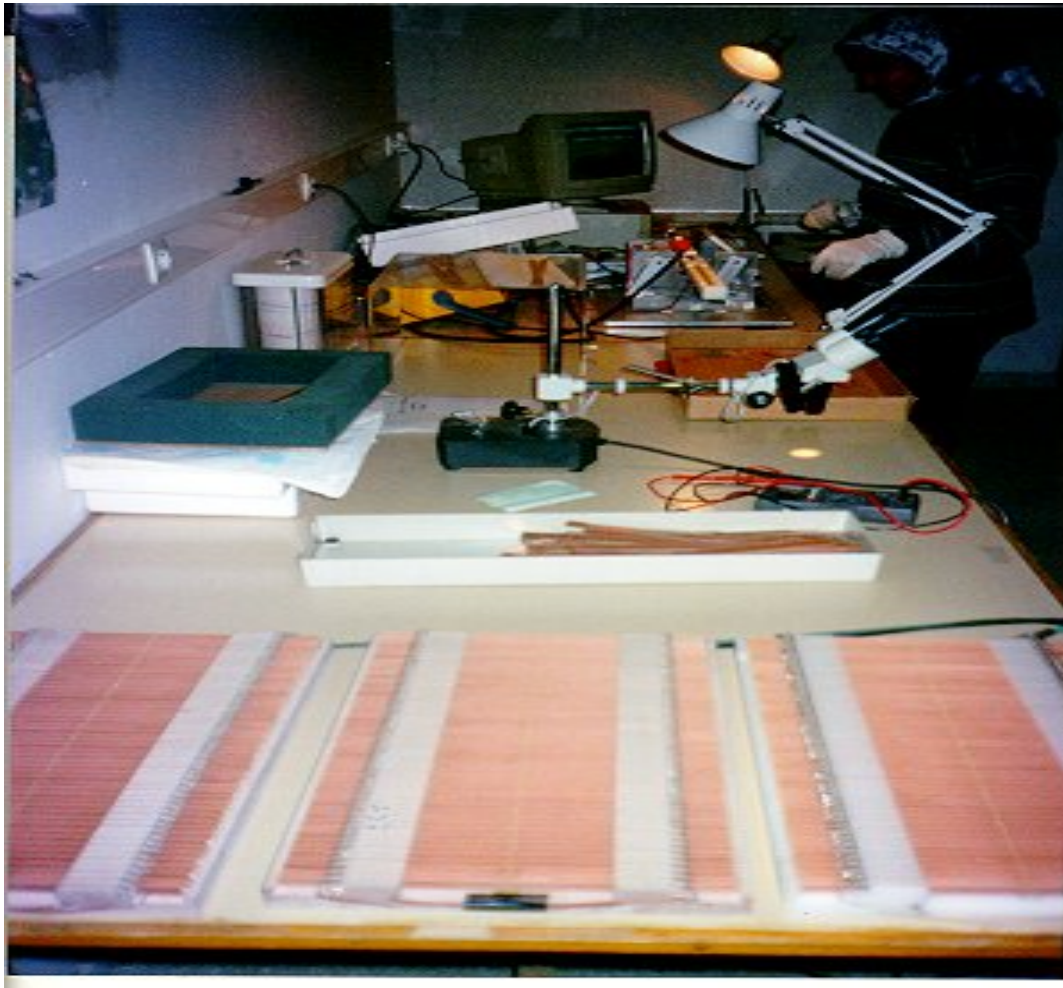


- 1996 Signature of ATLAS M&O
- An International Scientific Collaboration Program (PICS)  
1997 to 2001 - RUPHE and LPSC Grenoble (CNRST-IN2P3)
- Integrated Action from 2000 to 2003
- International Research Group (GDRI) set up by CNRS 2003  
to 2008
- 2007 signature of the CALICE M&O for the ILC program
- 2008 creation of the International Associate Laboratory (LIA)
  - International Laboratory for Collider Physics (ILCP)

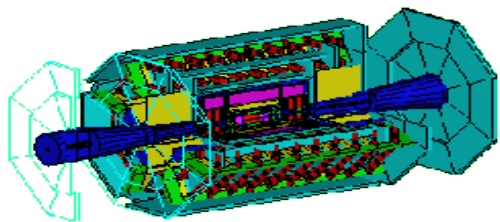




- Construction (LPSC-Grenoble and KTH-Stokholm) of the [ATLAS electromagnetic calorimeter presampler](#) from 1998 to 2003
  - Preparation and test of more than **70000 Anodes**
- Test benches in Casablnaca







# Morocco In ATLAS High Energy Physics Cluster



## *Experimental and Computing activities*

***RUPHE : Casablanca, Rabat, Oujda, Marrakech, Tanger, CNESTEN***

- Construction of neutron irradiation station at Grenoble in 1992-1993
  - Pollution of liquid Argon - Material selection 1998
- Physics simulation ( part of TDR, many thesis)
  - Participation in the study of the detector performance
- Construction (LPSC-Grenoble and KTH-Stokholm) of the [ATLAS electromagnetic calorimeter presampler](#) from 1998 to 2003
  - Preparation and test of more than 70000 Anodes
- Test beam and offline analysis (shifts, assembling, insertion, ...) from 2000 to 2007
- shifts, data taking offline analysis of LHC real data since 2008

- **Physics simulation** ( part of TDR, many thesis)
  - Participation in the study of the detector performance
- **Test beam** (shifts, assembling, insertion, ...)
- Analysis of combined test beam data
- **GEANT4** : Performance studies, simulation and reconstruction
- Others ATLAS software : ATHENA, ...
  - B physics and CP violation,  $W_R$ , heavy neutrinos
  - Cosmic run analysis and simulation
  - Quark top physics
  - Study of  $Z'$  and heavy neutrinos

## **Experimental part: Cosmic data and Calibration**

- cosmic data analysis, ATLAS and presampler response to cosmics.
- PS and Calorimeter calibration (Pedestals, Delays and Ramps).
- member of the first ATLAS Electronic Calibration team.

## **Physics Part: B-physics**

- ( $B_s \rightarrow J/\psi (\mu, \mu) \Phi (K, K)$ ,  $B^+ \rightarrow J/\psi K^+$ ) using CSC and MC08 data .
- Member of BtoJpsi ATLAS group. Responsible of the channel :  
 $B_d \rightarrow J/\psi (\mu, \mu) K_s(\pi, \pi)$  using both MC and real data.

## **Computing and Grid Part :**

- Member of the Distributed Analysis Shifters Team (DAST)
- The aim of this team is to help people to solve their grid problem (analysis tools and related problem, DDM problem and in some cases offline software problems)

## **Real Data Analysis and preliminary Results:**



# Le Bulletin

CERN welcomes its first doctoral students from Morocco



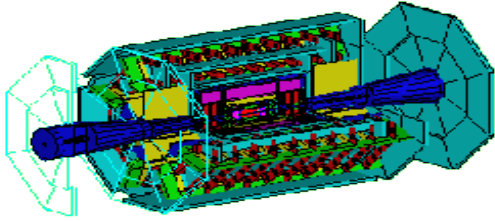
July 2010

1 - Scholarship at CERN funded by the **Academy HASSAN II of Science And Technology** –

Publications : **190** (1994 – 2012)

Ph.D Thesis : **12** (1999 – 2012),

**International Laboratory for Collider Physics (ILCP) :**  
**funded by France, Morocco and Sweden (2010)**



## Morocco In ATLAS since 1992



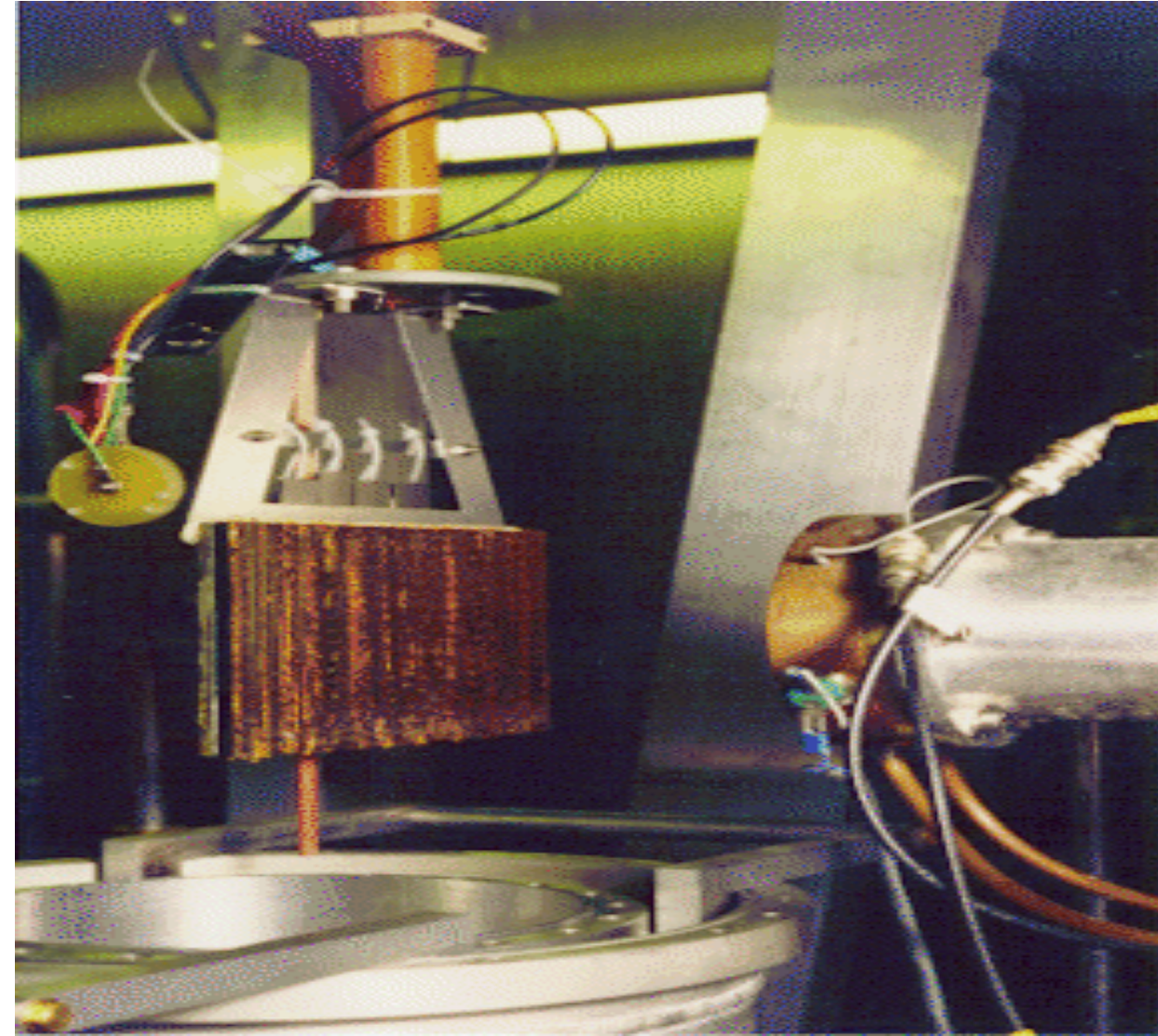
### Construction of neutron irradiation station in 1992

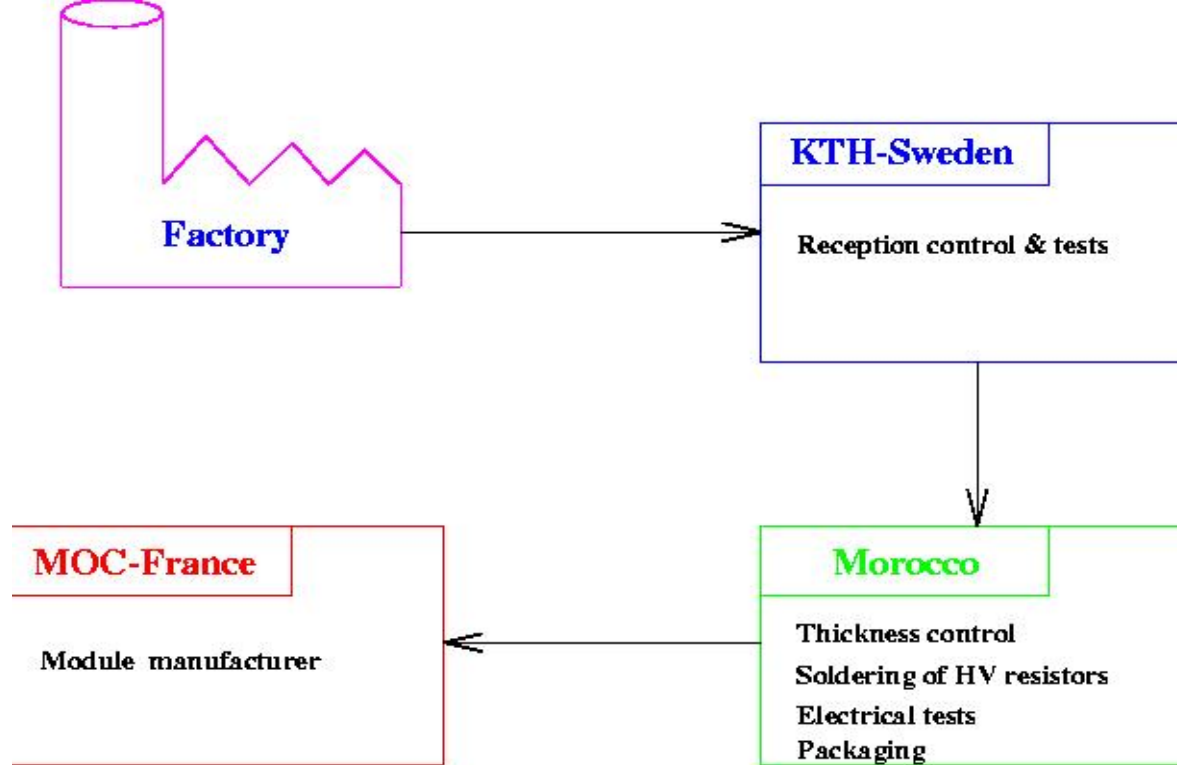
#### From 1992 to 1998, we study :

- electronics radiation hardness
- Pollution of liquid Argon
- Material selection for LAR Electromagnetic Calorimeter

#### Since 1996 Morocco is officially in ATLAS

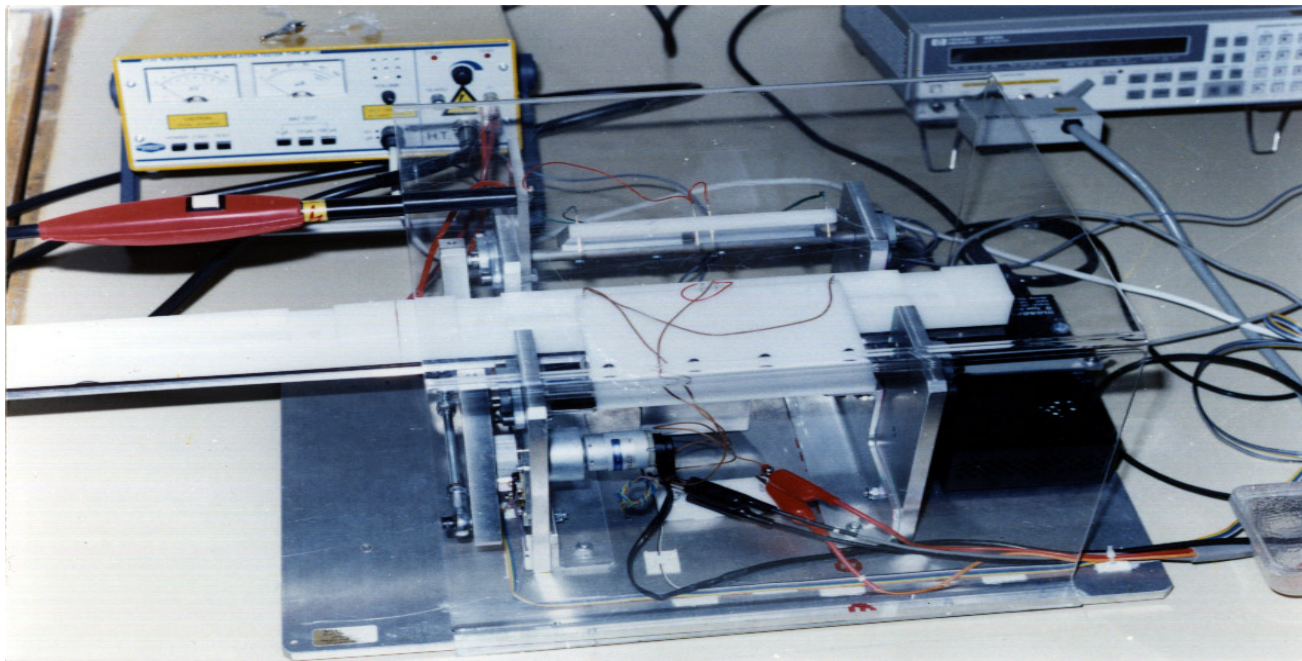
- After an unanimous vote by the ATLAS collaboration Board





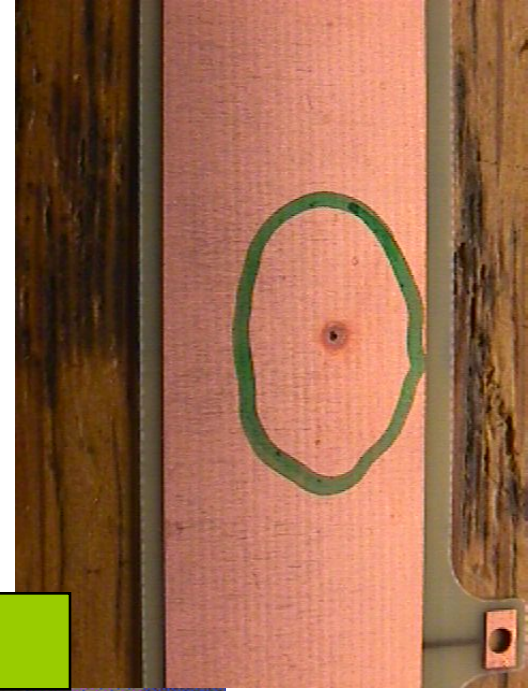
**2 Cleaning room at Casablanca and Rabat: 8 persons**

- Thickness measurement : **friction clutch micrometer**
- Resistance soldering : **4 x 1MΩ by Anode**
- Visual control : **Binocular**
- H.V long duration test (24 hours) : **4 plates (200 Anodes)**
- Electrical test : **test bench**
- Labelling, Packaging and shipping **to MOC factory (France)**



**Electrical test bench :**

- LCR meter
- High voltage supply
- rail and 2 arms
- PC with LabView



ATLAS testing laboratory in Casablanca

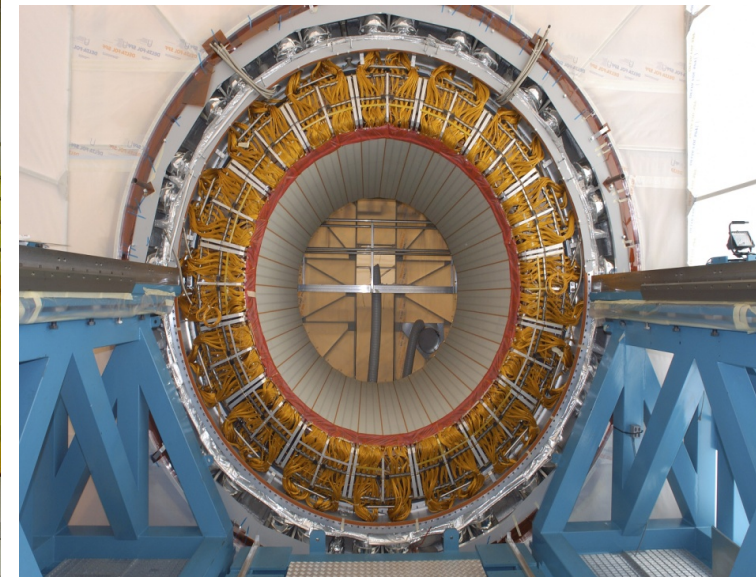
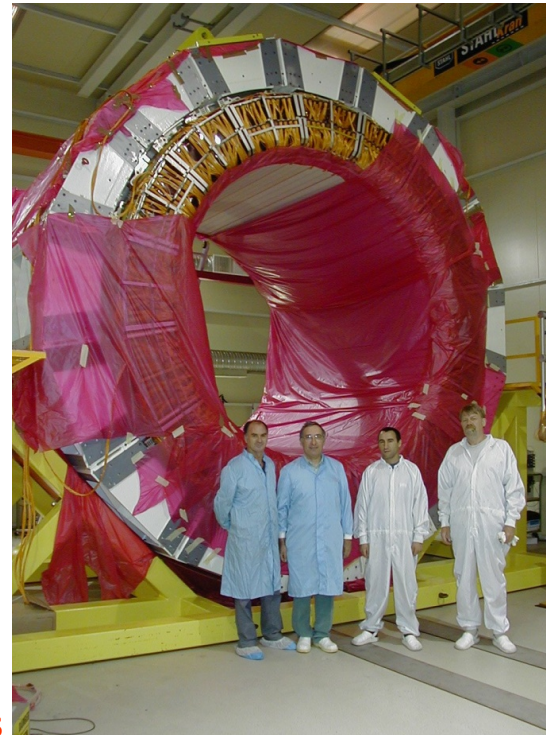
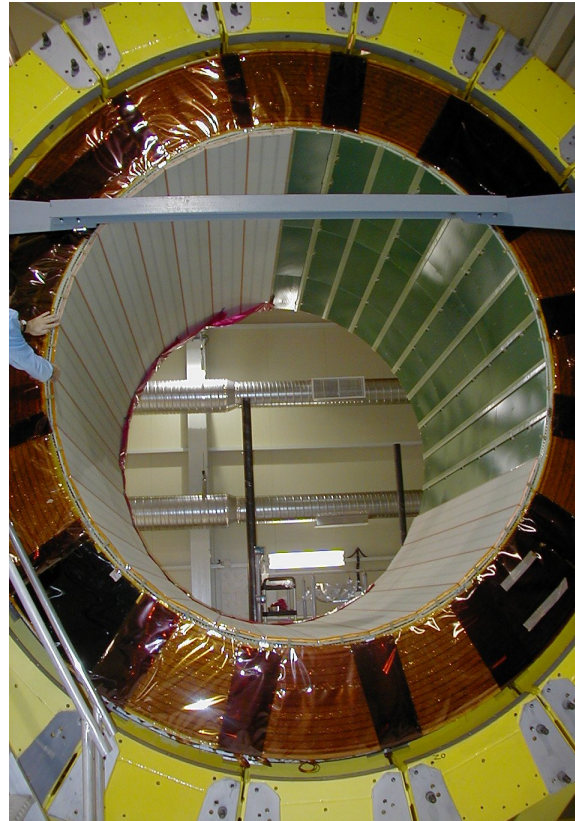
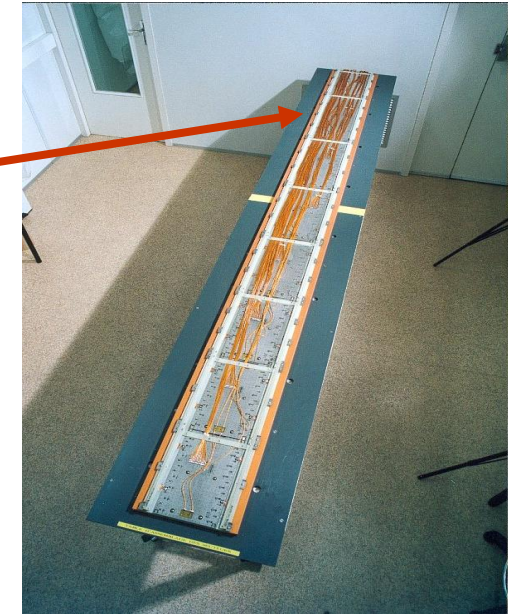
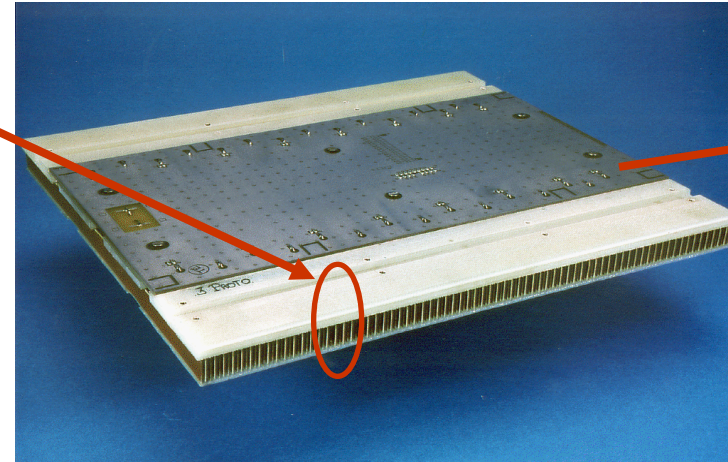
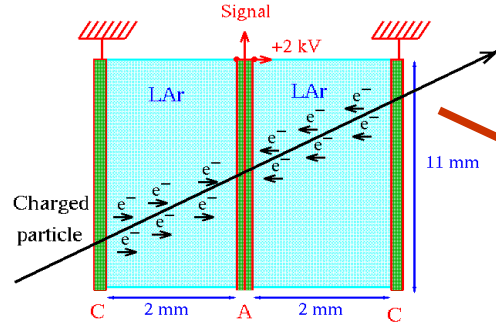


## Mechanics and electronics test bunch





# Presampler of the ATLAS E.M. Calorimeter Grenoble (LPSC) – Stockholm and Morocco



1 wheel of 32 sectors



ATLAS testing  
laboratory  
in Casablanca



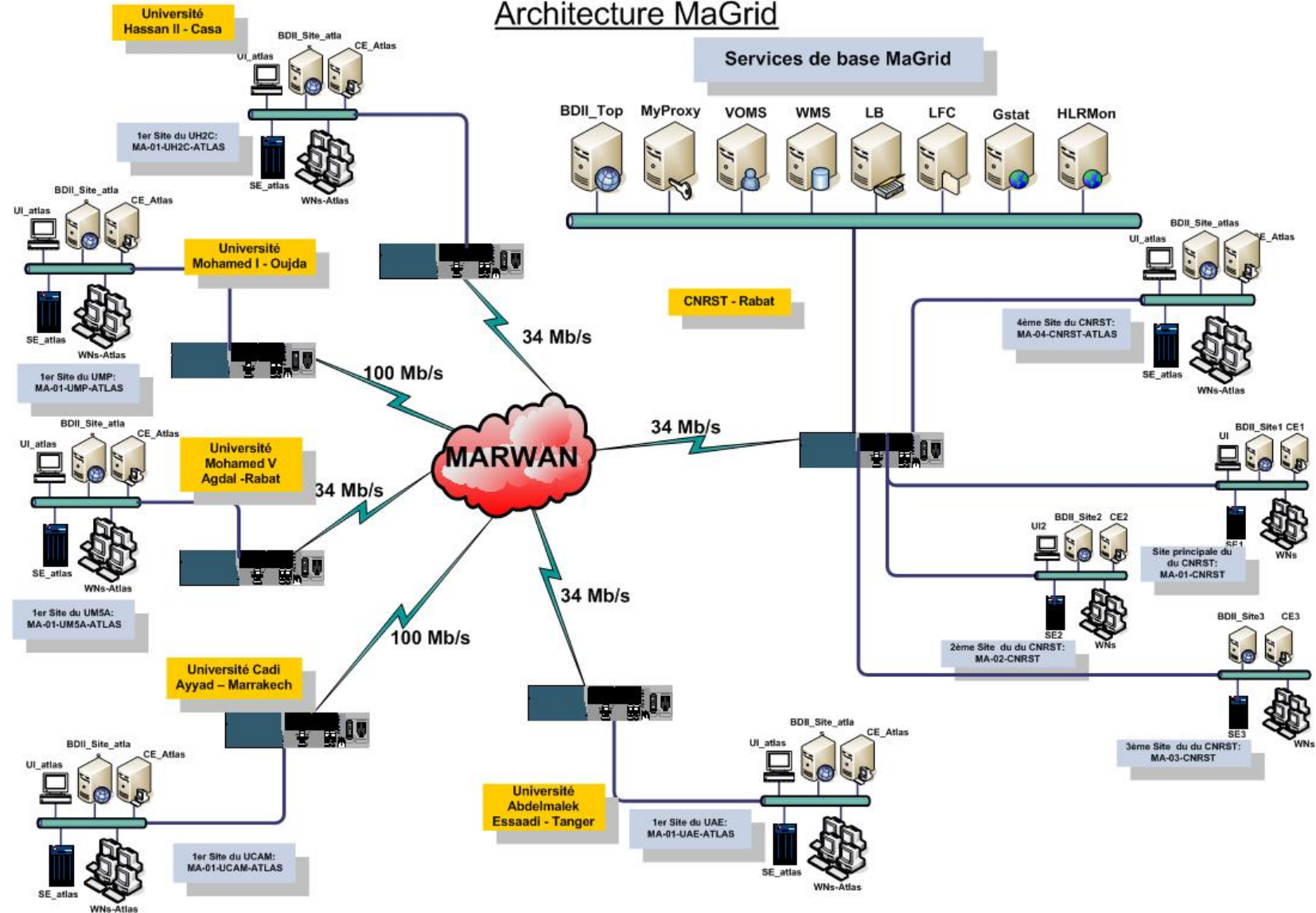
# ATLAS - CNRST

- Réception des serveurs (DON CERN) – 19/11/2012
- Installation et configuration des serveurs – 27/11/2012
- Visibilité du site sur Gstat et les autres outils de monitoring – 30/11/2012



# ATLAS - MAGRID

## Architecture MaGrid



Proposal to host the outside CERN ATLAS Week 2011  
at Marrakesh, Morocco  
October 3-7

Snowed Atlas mountains

By High Energy Physics cluster of Morocco  
& Cadi Ayyad University

With the support of ILCP



Réseau Universitaire de Physique des Hautes Energies- RUPHE-  
ATLAS OVERVIEW WEEK 2013  
07-11 October - Marrakech, Morocco



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