Possible Involvement of the AUTh group in the ARCHE project

Current Activities

Chara Petridou

On behalf of the Nuclear Physics Laboratory of the

Aristotle University of Thessaloniki

The Current Research Activities of the Nuclear Physics Laboratory at AUTH (I)

Radiation Physics, Environmental Radiation, Dosimetry

- Relevant for ARCHE project?
  - ThermoLuminescence (TL) : a Dosimetry method used for dating (1 Faculty: George Kitis)

Astroparticle Physics

- CAST Experiment (3 Faculty members: Ilias Savvidis, Christos Eleftheriadis, Tasos Liolios)
- KM3Net (1 Faculty member: Spyros Tzamarias)
- Relevant for ARCHE Project:
  - Experience with Corsica simulation
  - Experience with cosmic ray projects/experiments/simulations

Detector Development

- Neutron detectors (Spherical neutron detector project) (1 Faculty member: Ilias Savvidis)
- Relevant for ARCHE Project:
  - Experience with detector operation/detector development

The Current Research Activities of the Nuclear Physics Laboratory at AUTH (II)

Particle Physics

- ATLAS Experiment (3 Faculty members: Chara Petridou, Dimos Sampsonidis, Kostas Kordas)
- Relevant for ARCHE Project:
  - Experience with muon detectors: Construction, Test and Operation of the ATLAS muon detectors
  - Experience with Muon performance and reconstruction algorithms
  - Experience with TDAQ
  - Experience with cosmic ray data analysis and simulation
- Current responsibilities and commitments of the AUTH-ATLAS group:
  - Involvement in the Run 2 data analysis
  - Construction of the Micromegas LM2 chambers of ATLAS for the New Small Wheel project for Phase 1 (2017-2019)

http://skiathos.physics.auth.gr/atlas/

Current Activities of possible participants at AUTH (Nuclear Physics Laboratory)

Particle & Astroparticle Physics and Detector Development groups

Faculty members : 8

Technicians : - (3 retired and not replaced)

PhD students : 6 (3 in ATLAS, 2 in DetectorDev/Astroparticle)

MSc students: 5 (5 in ATLAS)

Undergraduate: ~20 with diploma theses (Physics students attracted to projects of the Laboratory)

Funds:

The ATLAS group was funded from 1999-2015 by National and EU projects (over 25 competitive research programs were asserted by the group)

The NSRF-ESPA projects ARISTEIA and THALES ended in October and November 2015

No funding for the immediate future !

Time-Line of the ATLAS activities(I)

1995:
Joint the ATLAS experiment

1997:
Establishment of the Muon chamber construction laboratory (funds from AUTh, GSRT)

CMM

3D Machine

Clean Room

Class 50000

Temperature ±0.5⁰C Humidity ±5%

1999-2003
Construction and test of the 10% of MDT chambers in ATLAS
(112 BIS chambers-)

Complete Cosmic ray set up operated

Time-Line of the ATLAS activities(II)

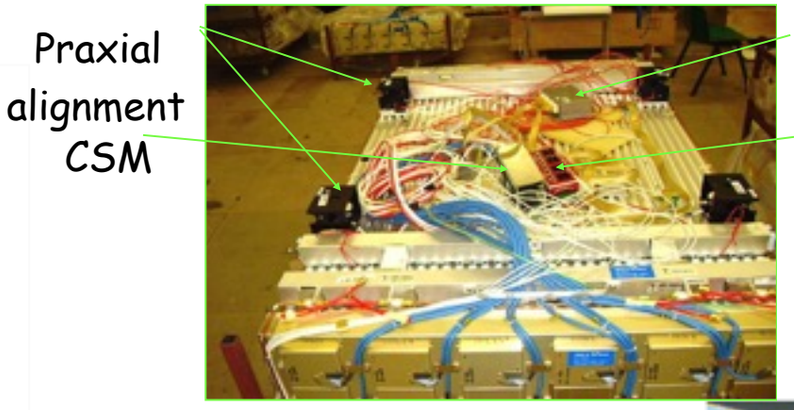
2003-2006: Installation and Commissioning

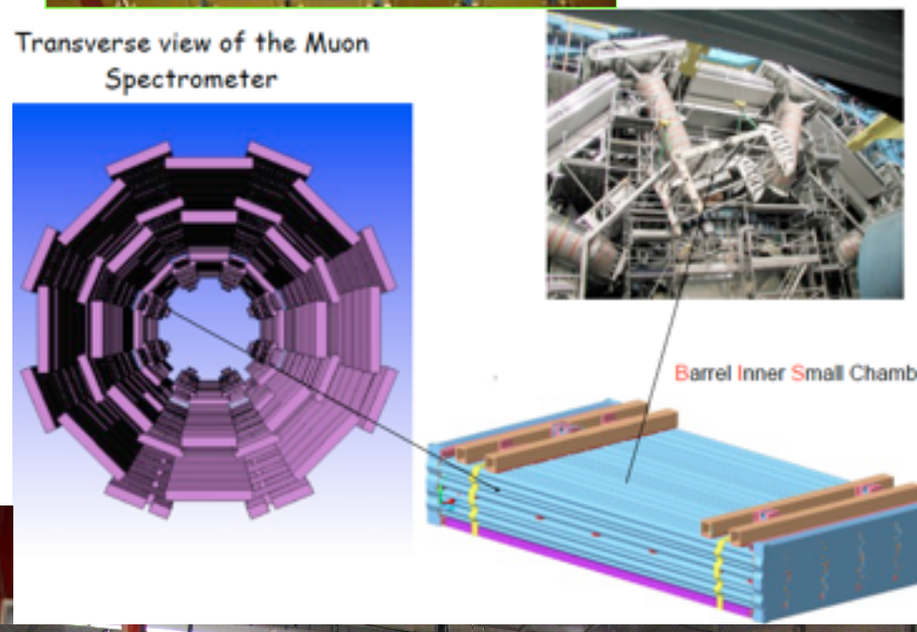
2006-2008: Test beam & Cosmic

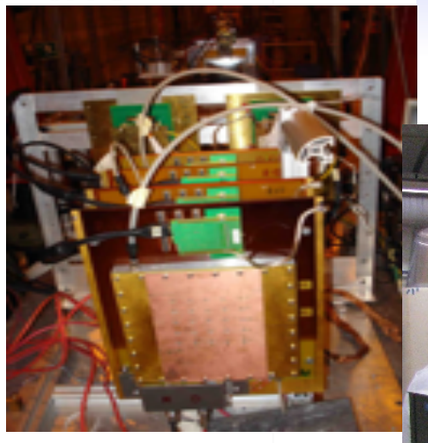
2008- : Detector development for the HL-LHC(micromegas-MM)

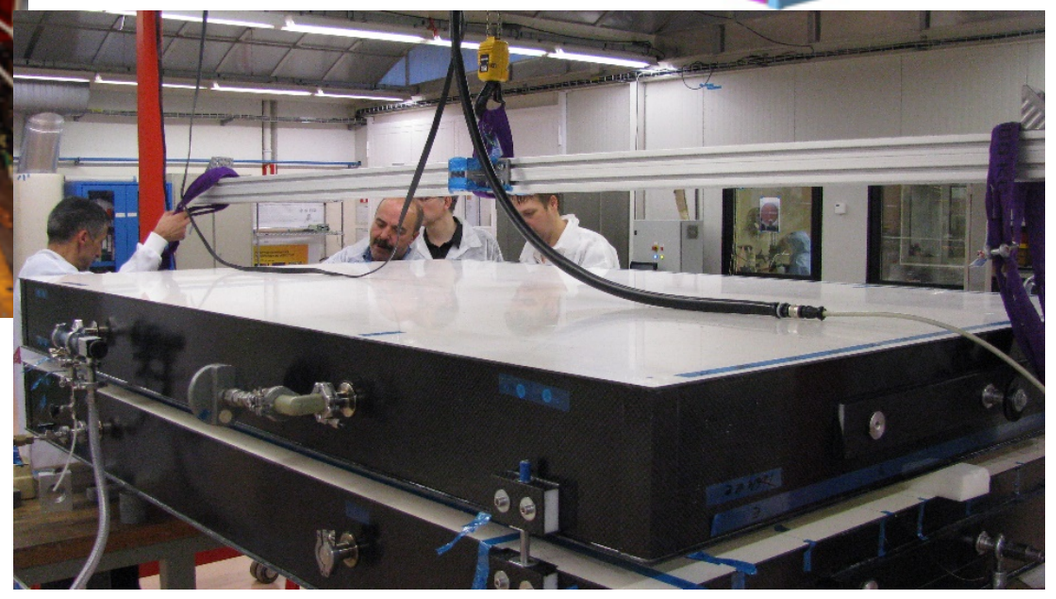
2009- : Physics Data Analysis

2013- : Preparation for the Construction of the LM2 MM chambers at AUTH









ATLAS PhD Theses: Completed or in Progress

PhD Theses:

on going

1. Gkaitatzis Stamatios, (Oct 2012) 'Studies of diboson production with ATLAS Data'.
2. Yiannis Maznas (Nov. 2014) "The FTK project of ATLAS and its Physics aspects"
3. Despoina Sampsonidou (Feb. 2015) "Search for New Physics in the 2l 2nu channel"

Completed

1. Iliadis Dimitris, 'Multimuon studies with the first ATLAS Data' (2009-2014)
2. Nomidis Ioannis, 'B-physics di-lepton processes with the first ATLAS Data' (2008-2012)
3. Vassiliki Kouskoura, 'Search for SUSY with the first data of ATLAS'. (2010-1013)
4. Petridis Andreas, 'Studies of four lepton processes with the first ATLAS Data'. (2008-2012)
5. Konstantinos Bachas, 'Studies for the ATLAS Muon Spectrometer with Test Beam and Simulated Physics Data'. (2004-2008)
   (Marc Virchaux Prize 2009 for outstanding PhD theses concerned with the ATLAS Muon Spect)
6. Krepouri Athanasia, 'Study of the performance of the ATLAS Muon tracking chambers in muon momentum reconstruction and its importance in the studies of Standard Model Physics'. (2000-2006)

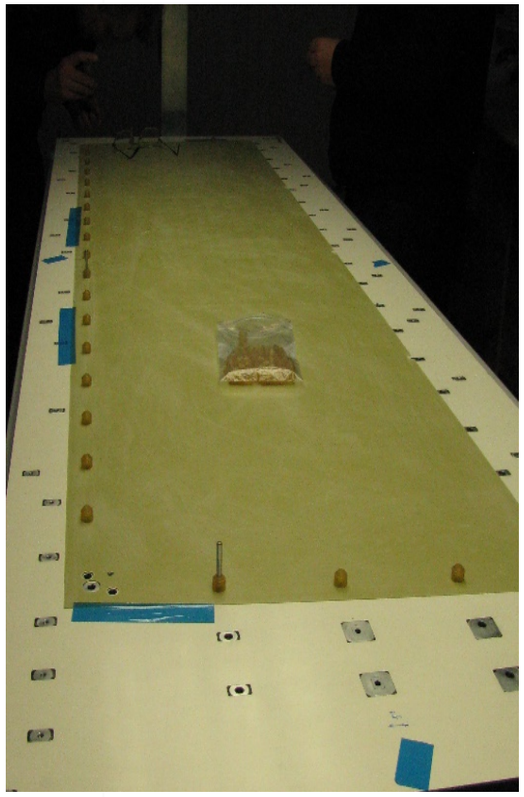
Concluding Remarks

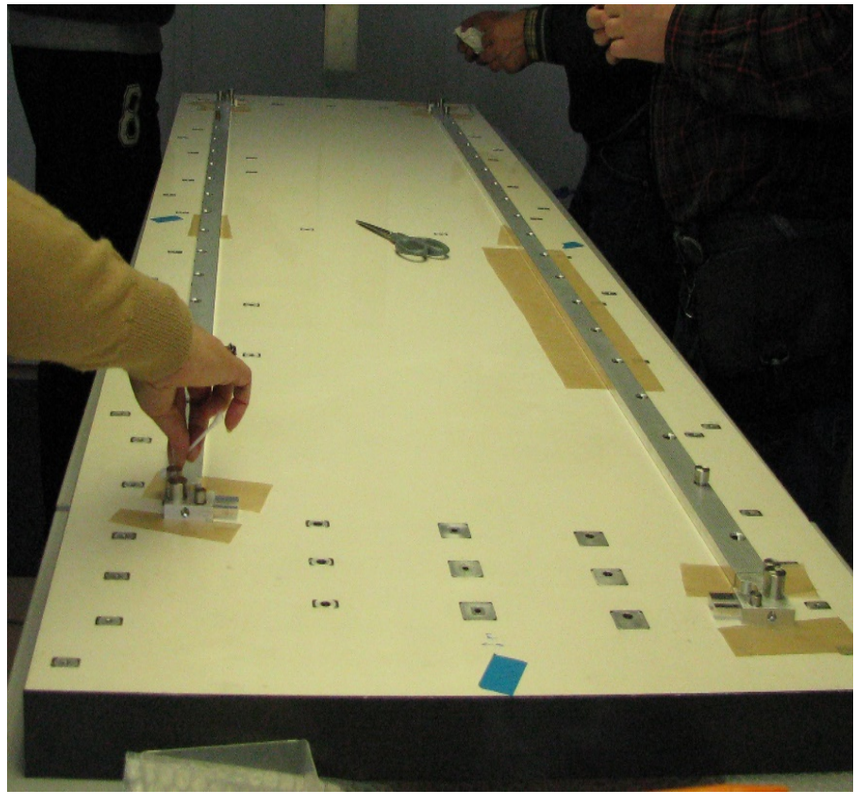
- The Particle, Astroparticle and Detector Development groups of the Nuclear Physics Laboratory of AUTH have the knowhow and the interest to participate in the ARCHE project
- The groups have the potential to attract high quality undergraduate and graduate students
- They have experience with Geant, Simulations in general and muon reconstruction in particular
- They have experience in construction, testing and operating of the muons detectors
- Because of lack of funds as of November 2015 have no access to Post Docs
- Their participation to the ARCHE project is heavily determined by funding constraints

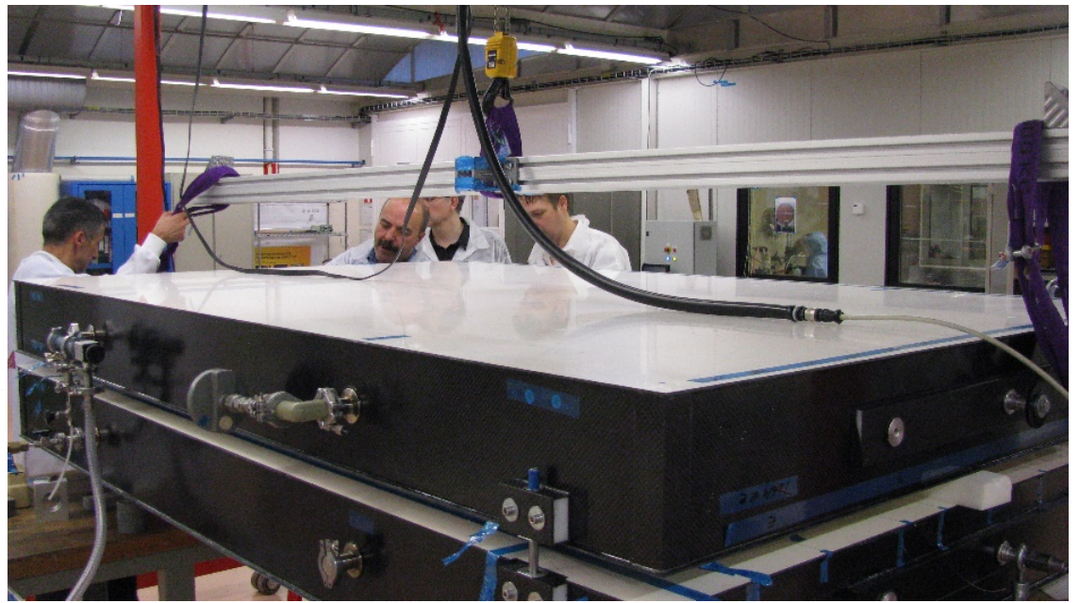
BackUp

The LM2 Module 0 construction at CERN

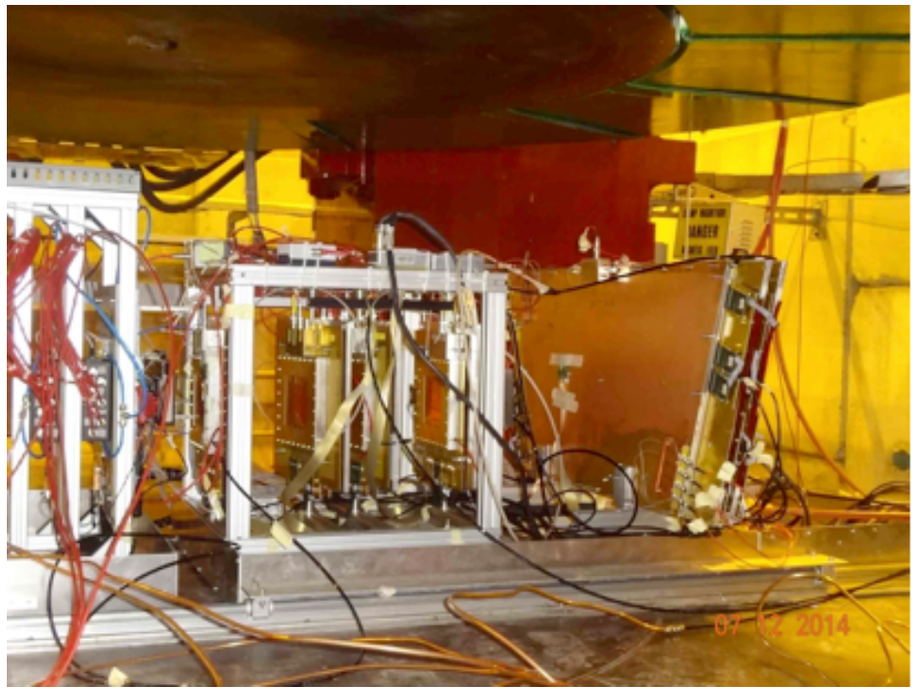
December 2015





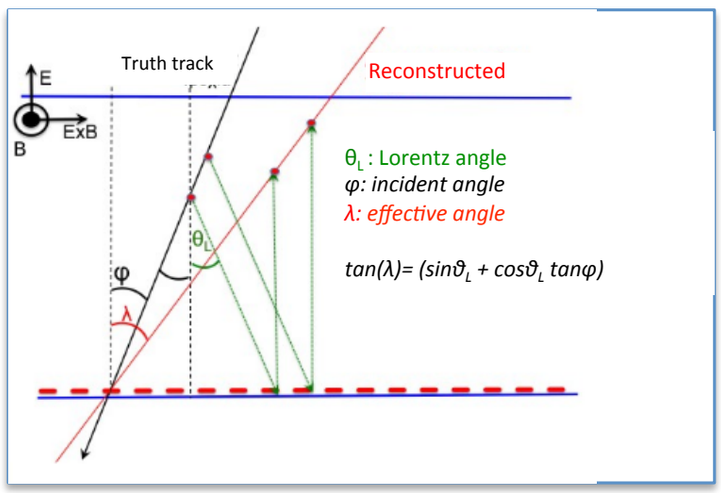


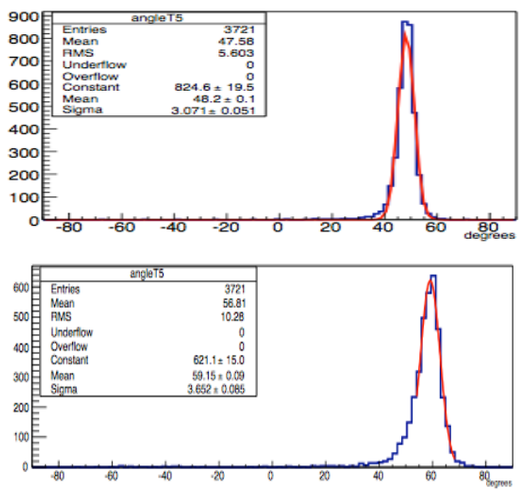
MM studies in test beams with magnetic field



Tracking with micromegas in magnetic field

- Corrections based on the knowledge of the local field are applied to all points.





*The reconstructed angle **α** before and after the correction. For incident angle and φ=30°, ϑ_L=20° λ=41.5°, expected α=48.5º. (complementary of λ). Corrected α=90°-30°=60° (complementary of φ)*

The reconstructed angle of incident, (effective angle λ), is biased due to Lorenz angle. Correction can give the truth angle of incident φ.