

EXPERIMENTAL HIGH ENERGY PHYSICS-NTUA

ΠΕΙΡΑΜΑΤΙΚΗ ΦΥΣΙΚΗ ΥΨΗΛΩΝ ΕΝΕΡΓΕΙΩΝ-ΕΜΠ

<http://www.physics.ntua.gr/hep/>

Evangelos N. Gazis
NTUA-HEP Team Leader

National Technical University of Athens
School of Applied Mathematical & Physical Sciences

CBI-II Preparation Meeting

NTUA-HEP Experimental Team

- **Professors**

T. Alexopoulos

E. Gazis

S. Maltezos

G. Tsipolitis

P. Christakoglou (NIKHEF)

K. Kousouris (CERN)

S. Vlachos (Scientific
Collaborator)

- **Emeritus Professors**

A. Filippas

E. Dris

E. Katsoufis

T. Papadopoulou

E. Fokitis

- **PhD Students**

F. Antoniou (completed)

T. Argyropoulos

G. Iakovidis

K. Karakostas

N. Karastathis

E. Karentzos

S. Leontsinis

E. Mountricha (completed)

K. Ntekas

E. Panagiotopoulou

E. Panagoulas

C. Tsarouchas (completed)

G. Zacharis

- **Graduate Students**

- **Diploma Thesis ...**

Task Force

• PhD Theses

F. Antoniou

CLIC/CTF3, Damping rings design (completed)

T. Argyropoulos

SPS/LHC, beam condition tuning

G. Zacharis

ATLAS/Physics Analysis/Leptoquark searches

G. Iakovidis

ATLAS/Trigger studies of MicroMegas, CSC/DCS

K. Καρακώστας

ATLAS/Physics Analysis/B-Physics, MUON Spectr. DCS

N. Καραστάθης

ATLAS/Physics Analysis/ $H \rightarrow WW$, MicroMegas DAQ, DCS

E. Καρέντζος

ATLAS/MicroMegas, NSW

Σ. Λεοντσίνη

ATLAS/Physics Analysis/Associated production Y

+ Z^0 , MicroMegas

E. Μούντριχα

ATLAS/Physics Analysis/ $H \rightarrow ZZ$, MDT, MicroMegas DCS

(completed)

K. Ντέκας

ATLAS/MicroMegas, NSW

E. Adamidi

ATLAS/EDUSAFE/DAQ, DCS

E. Παναγιωτοπούλου

ATLAS/Physics Analysis/Leptoquark searches

H. Παναγούλιας

H1/DESY/Physics Analysis/Leptoquark searches

Χ. Τσαρουχάς

ATLAS/Physics Analysis/ $\chi_b \rightarrow J/\psi J/\psi$, $B_s \rightarrow \mu^+ \mu^-$, central DCS

(completed)

23 June 2014

Research & Education

- **Period (1994-2006)**

- **1994-2006, CERN/ATLAS Collaboration:**

- ✓ **Ανιχνευτικοί Θάλαμοι Μιονίων BIS [Monitored Drift Tube Chambers-MDT]**

Design, Study, Prototype construction, Mass production, Quality check in operation with special R&D and cosmic rays, Installation, Commissioning, Maintenance, Improvements

- ✓ **Σύστημα Αυτομάτου Ελέγχου του Ανιχνευτή [Detector Control System-DCS]**

Design, Study, Control system R&D for the Muon Chambers (MDT), Operation and Maintenance with Experts on Call

- **1998-2004, DESY/H1 Collaboration**

- ✓ **Σύστημα Σκανδαλισμού του ανιχνευτή [Trigger system for the Detector]**

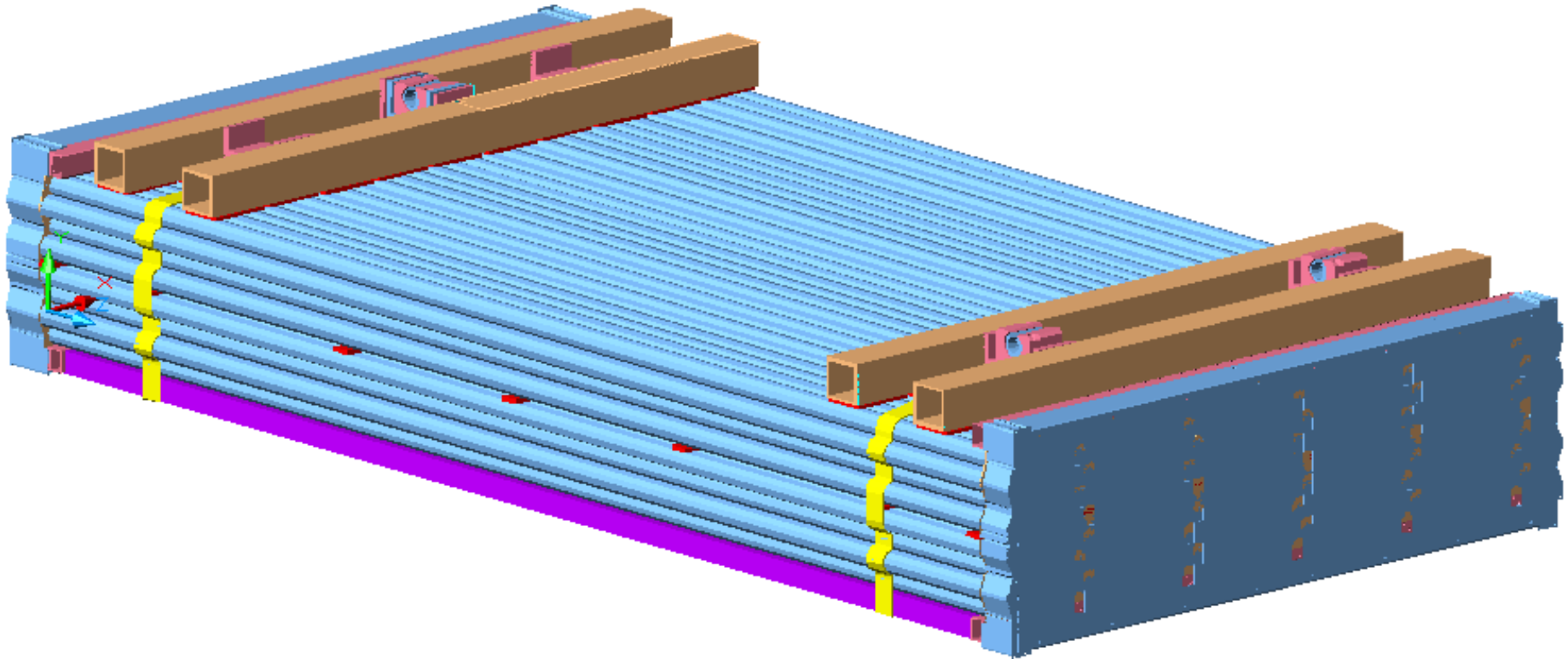
Study, Proposal for operation improvement

- ✓ **Ανάλυση Πειραματικών Δεδομένων του ανιχνευτή [Physics Analysis]**

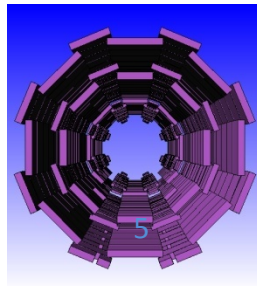
Physics results with b-quarks and Leptoquarks

Greek muon MDT (BIS)






112 (90 BIS30 +22 BIS36) Chambers



April 2017



Research & Education

- **Running Period (2006-2014)**
- **2006-Today, CERN/ATLAS:**
 - ✓ Σύστημα Αυτομάτου Ελέγχου, **DCS of the Detectors MDT and CSC**
 - Detector Control System (DCS) for the MDTs and CSCs, upgrade of the software and the system servers.
 - System R&D for DCS data access in real time, the DCS Data Viewer-DDV, via the media [    ]
 - Installation, Commissioning and Operation of the Muon Chambers MDT-EE
 - ✓ Ανάπτυξη ανιχνευτή **Micromegas R&D and New Small Wheel Construction**
Study of operating parameters, Design, Beam test of the detector prototype, Data Analysis, Front-End Electronics
 - ✓ Ασύρματο Σύστημα Ασφαλείας Προσωπικού (Wireless Personnel Supervision Security system-WPSS) **Transfer Technology to Greek Companies**
R&D for data taking and detector control system, Radiation background radiation and data sent for the personnel protection to the ATLAS cavern

ATLAS Supervision Post and Augmented Reality Project

The Smart Hat :

Helmet
High definition camera
Illumination



Bi-directional
Audio device



Head Mounted
display



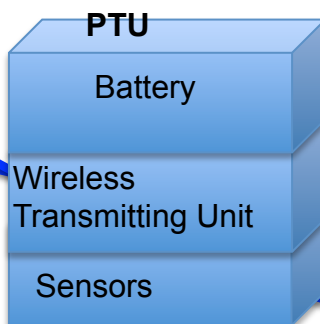
Portable Computer
Detailed Procedure
visualization
Environment parameters



Active gamma
dosimeter

PRISMA ELECTRONICS
NOVOCAPTIS S A

NOVOCAPTIS S A



Handheld Camera

Research & Education

- **CERN/RD51-AIDA**
 - ✓ R&D gas micropattern detectors (Micromegas, GEM) for the future experiments LHC-HE/HL, ILC, CLIC
 - ✓ R&D Methodology for tracking recognition with the Radon transformations
 - ✓ R&D detector control system for the new detectors
- **CLIC (= Compact Linear Collider)**
 - ✓ Design and prototyping for damping rings for the fixing of the inter-scattering effects of the beam electrons
 - ✓ Design, Study, Prototype construction of the two beam module support (girder). Study of the material properties. Tests of the materials in a high neutron background
- **EDUSAFE, Medical Applications, Proton therapy, Radio-isotopes**
 - ✓ Personnel of the ATLAS cavern radioprotection from the radio-protection using Augmented Reality (AR)
 - ✓ Study, Design and Coordination in the Region of Thessaly, for the installation of the Center for the Cancer Therapy with proton beam
 - ✓ Medical Radio-isotope production
 - ✓ PET tomography improvement

Research & Education

- **Innovation & Transfer Technology**
 - ✓ Member of the European Transfer Technology Network **HEPTech**, 2008-Today
 - ✓ E Gazis, Coordination of **HEPTech** network, 2012
 - ✓ Meeting of the CERN-Greek Industries, 2007, 2009, 2010, 2011, 2013, 2014
 - ✓ Academia-Industry Matching Event (AIME): Controls Technology on Accelerators & Detectors, Athens, 2-5 December 2013
- **Εκλαϊκευση Φυσικής Υψηλών Ενεργειών – HEP Outreach**
 - ✓ Masterclasses at NTUA from 2003, with the HEP - Theory Group
 - ✓ Talks in Universities, High Schools, Municipalities etc. in Greece
- **Επιμόρφωση Καθηγητών Φυσικής Μ.Ε. – Training of High School Teachers**
 - ✓ Coordinator of the High School Teachers training at CERN, from 2008. About 540 teachers have been trained.

Applications & Innovation - Transfer Technology

- **Proton therapy**

LOCMAF : a **LOW** Cost **M**ulti-use **A**ccelerator **F**acility for medical applications

PHYSICS ON HEALTH, CERN, 2-4 Feb 2010

M. Kydonieos (Diploma Thesis)

“Epidemiology of cancer and Design of a medical synchrotron”

- **European Network**

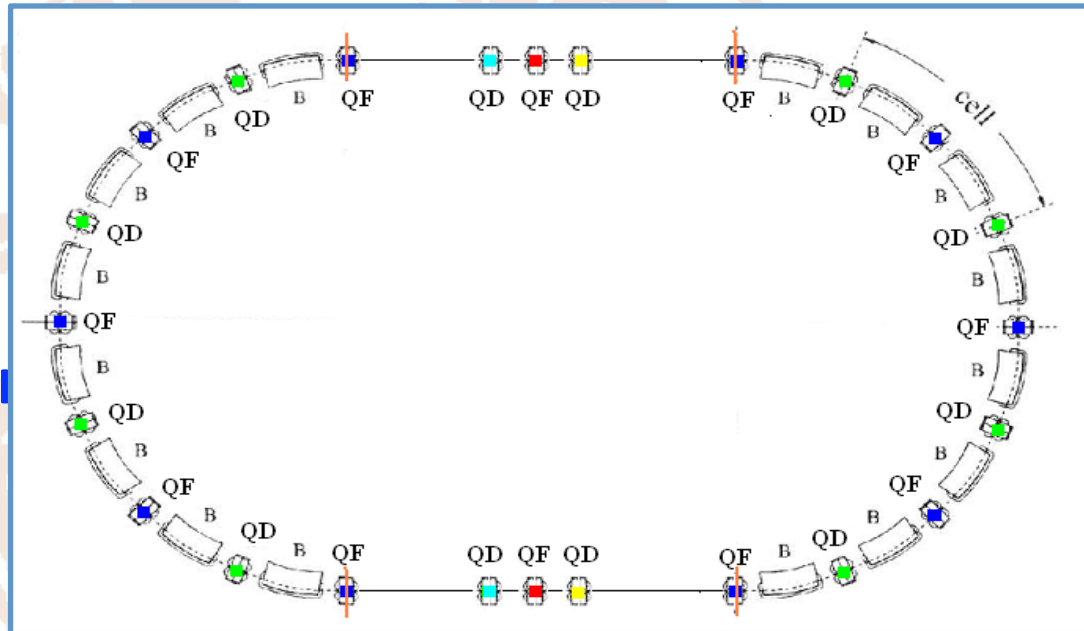
E. Gazis, Coordinator HEP Tech,

- **IDEALSQUARE**

CBI-2013-14 *Challenge Based Innovation*, NTUA School of Architecture Engineering

CBI-2014-15 NTUA School of Applied Mathematical & Physical Sciences

NTUA School of Mining and Metallurgy Engineering



Research & Education

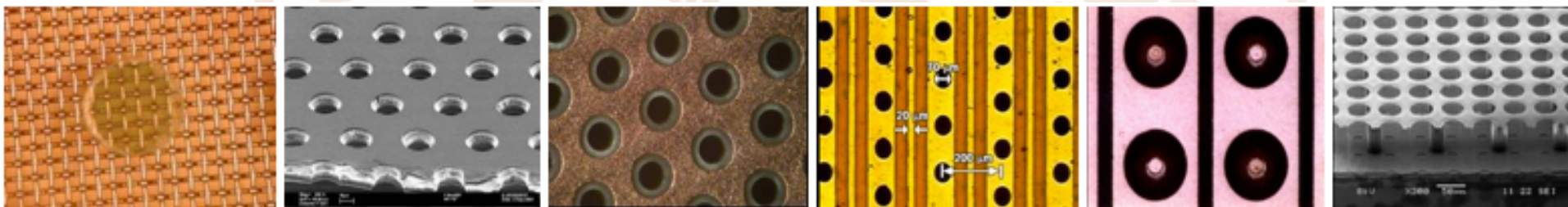
• Future Actions (2013-2017)

• CERN/ATLAS: Micromegas, New Small Wheel (NSW)

- ✓ R&D micromegas detectors of large dimensions 1.2mX0.6m for the NSW of the ATLAS Muon Spectrometer
 - ✓ Study, Construction and Test of the electronics (FE, Read-out) for the NSW micromegas
 - ✓ Software R&D for data taking and analysis
 - ✓ Study, Design and Installation of the detector control system (DCS) for the NSW
- ### • Physics Analyses: B-Physics, Higgs searches, Exotics
- ✓ Special physics channel analysis $B_s \rightarrow \mu^+ \mu^-$, $X_b \rightarrow J/\psi J/\psi \rightarrow \mu^+ \mu^- \mu^+ \mu^-$, $H \rightarrow WW^* \rightarrow l\nu l\nu$ plus and investigation for the double or single leptoquark

Collaborations

- ✓ ATLAS Collaboration: 177 Universities, 38 Countries
- ✓ EDUSAFE: CERN, EPFL, TU-Munich, Roma2, NTUA, AUTH, UoAthens, DUTH, PRISMA CANBERRA, NOVOCAPTIS
- ✓ IDEALSQUARE: CBI, ... new projects?
- ✓ RD-51: Micro-Pattern Gas Detectora
- ✓ CLIC Collaboration, 41 Universities, 21 Countries



MicroMegas

GEM

THGEM

MHSP

microPIC

Ingrid

Επίλογος - Epilogue



“... 'Ὦν ἔστιν γάρ ἡμῖν τοῖσὶ τε τῶν φύσεων τοῖσὶ τε τῶν τεχνῶν ὀργάνοις επικρατέειν, τούτων ἔστιν ἡμῖν δημιουργοὶς εἶναι, ἄλλων δὲ οὐκ ἔστιν”

“... εκεί που μπορούμε να υπερισχύσουμε με την βοήθεια των φυσικών και επιστημονικών οργάνων, εκεί, μόνο, έχουμε τη δυνατότητα να γίνουμε δημιουργοί!” Ιπποκράτης 460-370 π.Χ.

“... there, we can prevail with the help of the physical or the scientific instruments; there we, only, have the possibility to become creators” Hippocrates 460-370 BC

Hippocrates was born around 460 BC on the island of Kos, Greece.

*He became known as the **founder of medicine** and was regarded as the **greatest physician** of his time.*

*He based his medical practice on **observations** and on the **study** of the **human body**.*

*He **rejected** the views of his time that considered **illness** to be caused by superstitions and by possession of evil spirits and disfavor of the gods.*