The Greek activities @ CLIC/CTF3 & Accelerator Technologies

EVANGELOS N. GAZIS
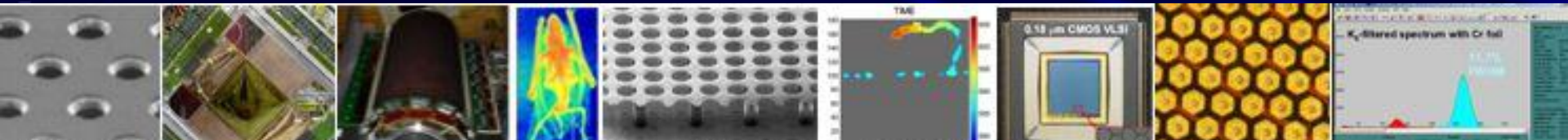
National Technical University of Athens

SCHOOL OF APPLED MATHEMATICS & PHYSICS SCIENCES

Greek Kickoff Meeting, CERN, 02/11/2011

1954-2004 CERN

Globe of Innovation

Thomas Jantscher

Outline

1. Targets – Perspectives

1. CLIC/CTF3
   - Mechanical Support
   - Beam physics
   - Instrumentation
2. Other Accelerators
   - SPS
   - LHC

3. Applications & Transfer Technology, Outreach
   - Radioprotection
   - Proton Therapy
   - TT-Network-Greek Industries
   - Outreach activities
4. Conclusions

Targets – Perspectives

Fruitful and essential participation to the CERN accelerator projects on a including:

1. **Accelerators :** Study-, design-, construction- of modules, physics problems, instrumentation, data analysis
   - SPS
   - LHC
   - CLIC

2. **Applications & Transfer Technology, Outreach :** Study, participation, education
   - Radio-protection
   - Proton Therapy
   - TT-Network-Greek Industries
   - Outreach

Perspectives : A distinguished full research activity spanned to the accelerator science domain aiming to couple with the Particle Physics research (Hardware and Software) to develop Applications in the Industry in cooperation with **many HEP and Engineering research teams** from Greece and other countries.

1. Accelerators

Accelerators: beam optics studies, accelerator operation improvement, beam instrumentation

- SPS

Th. Argyropoulos (NTUA)
Studies of longitudinal instabilities of the LHC proton beam in the SPS double RF system

- LHC

Ch. Kokkinos (UoPatras)
Design, Analysis & Performance for Nb_3Sn accelerator magnets
Ev. Antonopoulou (NTUA) (apologies to her)
Simulation studies for quench effect of the LHC magnets
NTUA, AUTH TEI-Athens, TEI-Piraeus

- CLIC

M. Anastassopoulos, F. Antoniou, M. Ikarios, N. Gazis,
S. Orfanelli (NTUA), Eirini Koukovini-Platia (EPFL)
I. Kossyvakis (UoPatras), P. Zisopoulos (NCUA) (apologies to him)

- APPLICATIONS

E. Sagia (NTUA), (apologies to her)

Studies of longitudinal instabilities in the SPS RF system

Kick-off meeting for Greek students to
CLIC/CTF3 & Accelerator Technologies
02/11/2011
T. Argyropoulos (NTUA \ CERN-BE/RF/BR)
CERN Supervisor: Dr. E. Shaposhnikova (BE/RF/BR)
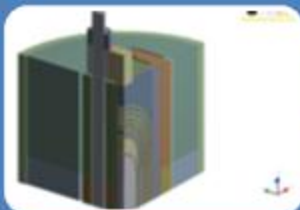**NTUA Supervisor**: Prof. E. Gazis

MCXB

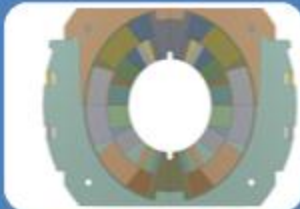- Dipole, Orbit Corrector
- NbTi Cable
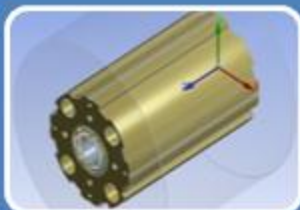
MCXB-DL

- Quadrupole, Orbit Corrector
- NbTi Cable

SMC

- Racetrack Configuration, R&D
- Nb3Sn Cable

11T - SMC

- Dipole, Collimator
- Nb3Sn Cable

Greece @ LHC CRYOGENICS :

(NTU, AUTH, TEI-ATH, TEI-PIR, 2006-2008

Collaboration agreement K1257/AT/LHC (2/2006-9/2008)

Accelerator Department in Cryogenics Instrumentation and Controls

Greek Coordination: NTU_Athens

New Collaboration Agreement under discussion for 10 NTU_A Metallurgy Engineers students to wok at the LHC upgrade on 2013-2014!!

1. Accelerators

- ## CLIC

M. Anastassopoulos (NTUA)
Mechanical design, analysis and integration of pre-alignment systems for CLIC

F. Antoniou (NTUA)
Optics design and optimization of the CLIC Pre-damping and Damping Rings

E. Ikarios (NTUA)
Beam phase stability at CTF3

N. Gazis (NTUA, Mechanical Eng)

Study and Fabrication of the prototype Supporting System for the CLIC Two-Beam Module

E. Koukovini-Platia (EPFL, Mechanical Eng)

Impedance budget and effect of chamber coating on CLIC DR beam stability

I. Kossyvakis (UoPatras, Computer Eng & Informatics)

Development and implementation of the Inventory Database for the components of the CLIC Two Beam Module
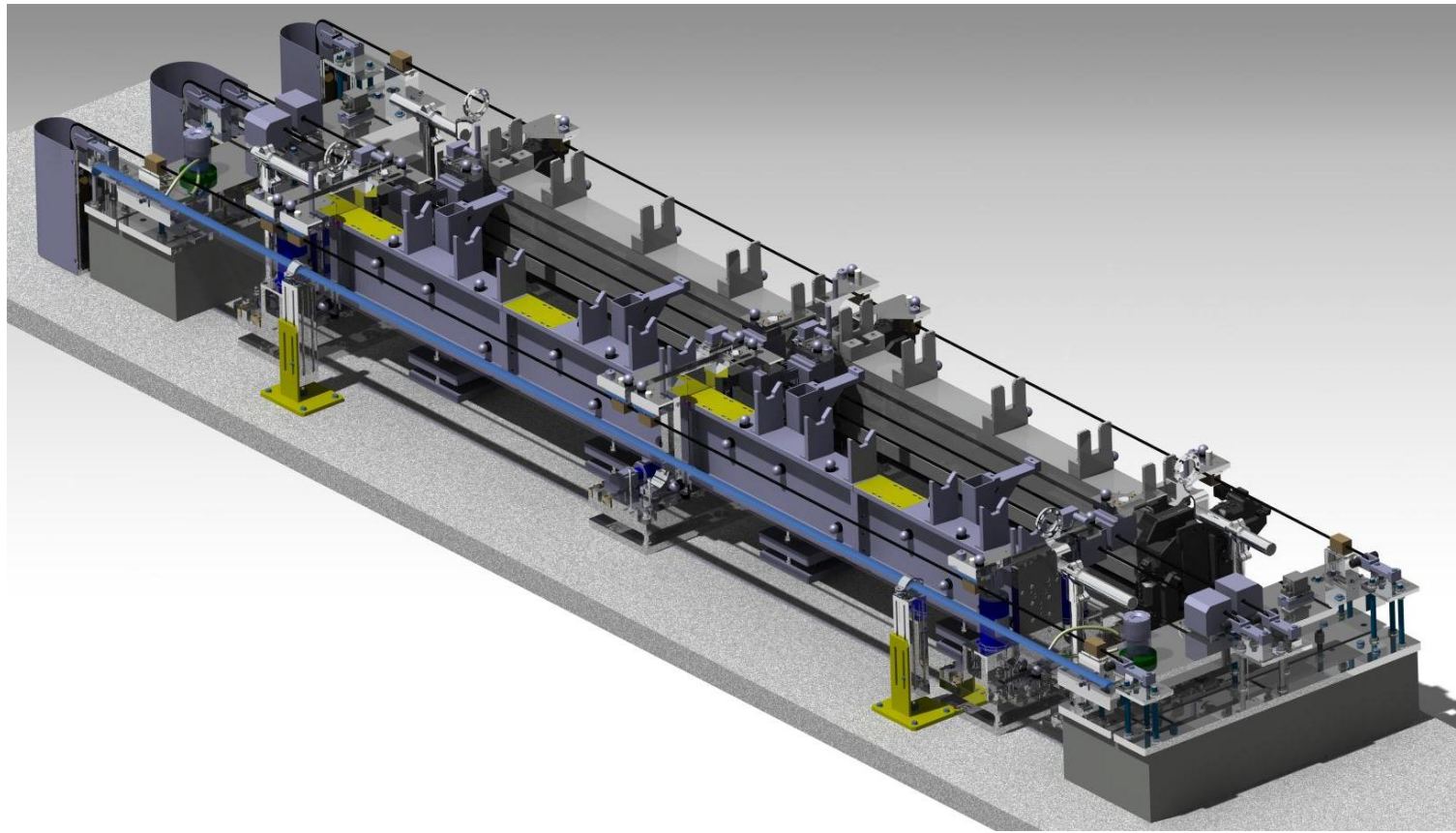
P. Zisopoulos (NCUA)

Lattice loop design for the DR

S. Orfanelli (SEE&CE-NTUA)
Beam Loss Studies for CLIC

Mechanical design, analysis and integration of pre–alignment systems for CLIC

M.Anastasopoulos / BE–ABP–SU

Optics design and optimization of the CLIC Pre-damping and Damping Rings

F. Antoniou, NTUA/CERN, BE/ABP/CC3
CERN Supervisror: Dr. Y. Papaphilippou
NTUA Supervisor: Prof. E. Gazis

Kickoff meeting for Greek students at CLIC/CTF3 and Accelerator Technologies, 2 Nov. 2011, CERN

Beam Phase Stability at CTF3

Outline

- CLIC acceleration scheme

- CTF3

- Phase Measurement & Analysis

- Conclusions

- Future Plans

Kickoff meeting for Greek Students
at
CLIC/CTF3 and Accelerator Technologies

Study and Fabrication of the prototype Supporting System for the CLIC Two-Beam Module

Input from: **Germana Riddone, Alexandre Samochkine, Helene Mainaud-Durand et al**

Impedance budget and effect of chamber coating on CLIC DR beam stability

E. Koukovini-Platia
CERN, EPF Lausanne

Acknowledgements
G. Rumolo, K. Li, N. Mounet, B. Salvant
CERN

1

- **Development and implementation of the Inventory Database for the components of the CLIC Two-Beam Module**

- **Software Development for the thermal tests of the prototype mock-up RF-components of the CLIC Two-Beam Module**

Ioannis Kossyvakis

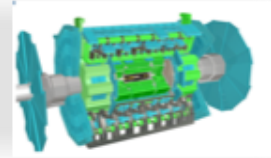Computer Engineering & Informatics Department

University of Patras

Greece

02/11/2011

New participation under further discussion

MDT/CSC DCS + MMegas SDC

DCS = Detector Control System = Slow Control

- **Improvements and maintenance of MDT Power supply DCS and Front-end Electronics Monitoring.**
- **CSC DCS Coordinator, working to constantly have the detector safely working and maintain the compatibility with the central DCS.**
- **Maintain Muon DCS test facilities.**
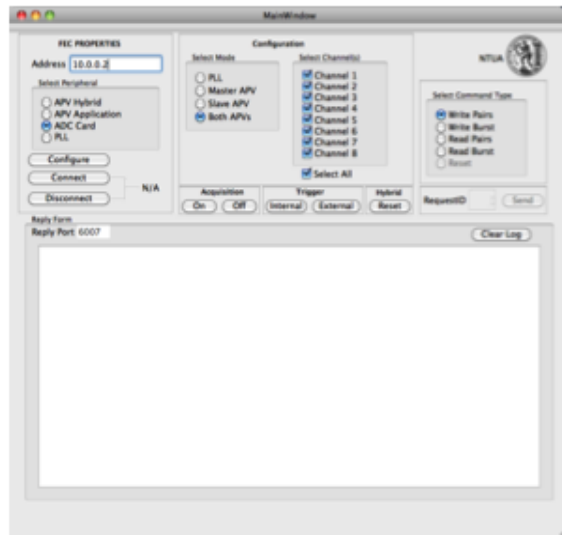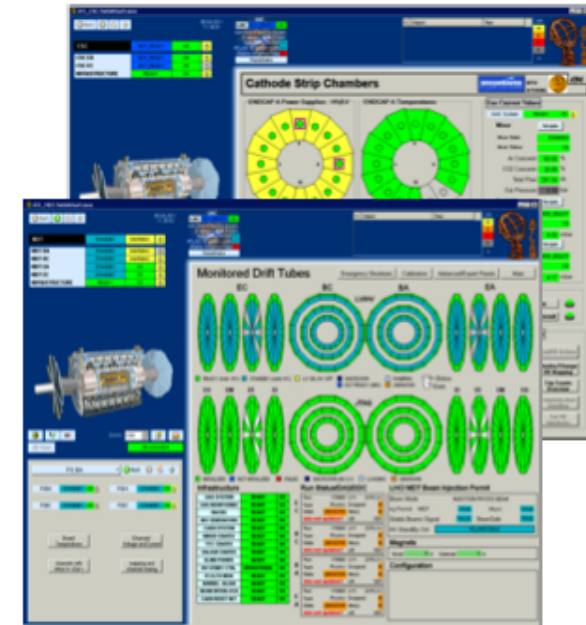
- **Create Scalable Readout Control System for the MMegas detector that is now on ATLAS cavern.**

DCS Data Viewer (DDV) for the ATLAS Detector

Goals and Specifications

- It focuses all the ATLAS community
- Flexible, User Friendly
- Fast time respond
- Independent environment (linux/windows/macOs)
- Data base protection

Characteristics

- Custom-client architecture
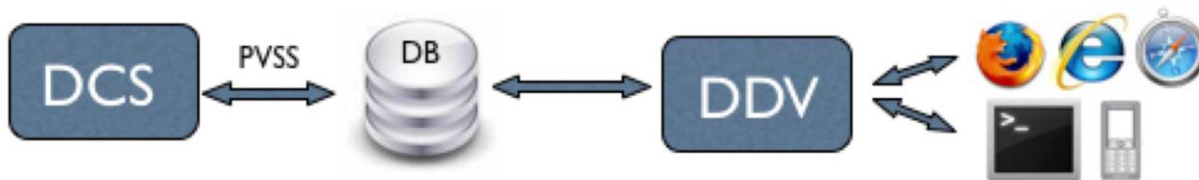- The client is written in python, functions autonomously
- The client is written in open software Google Web Toolkit
- Search machine for easy finding DCS data
- Data to plots, histograms, ascii files and ROOT
- Storage possibility to XML files for future use
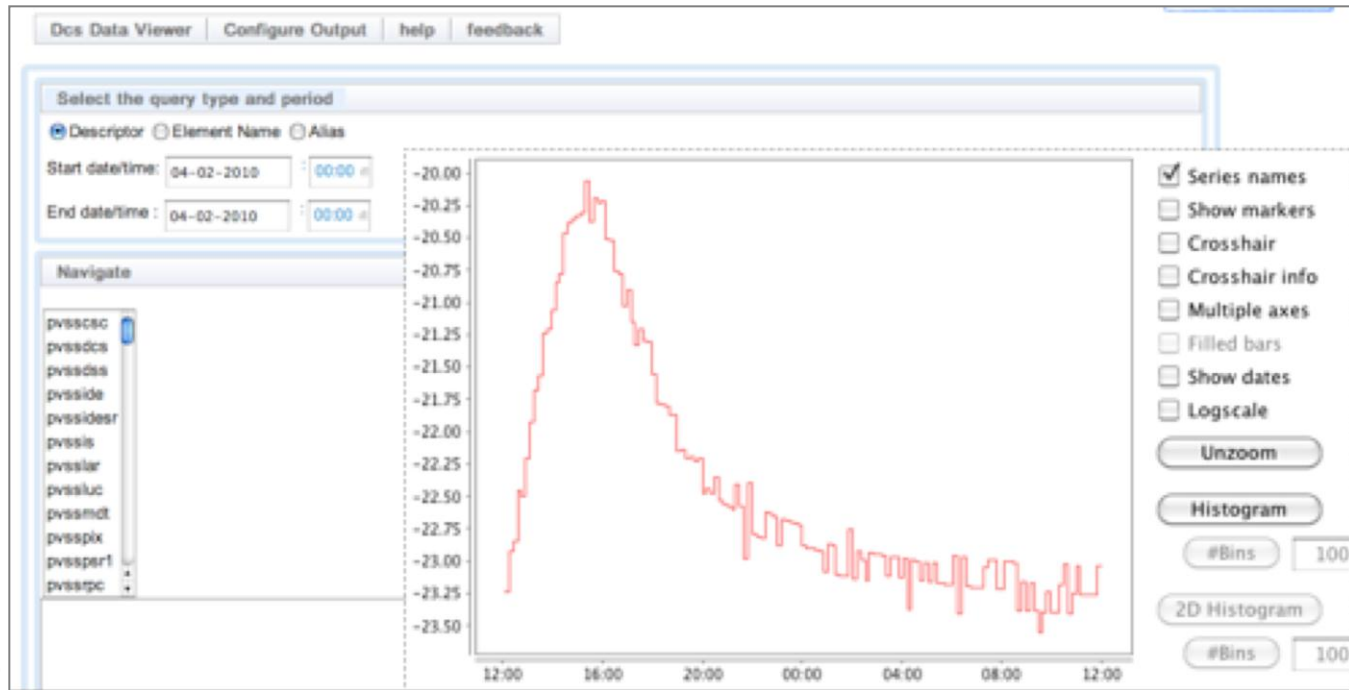
→ **The DDV is one of the ATLAS central services**
→ **Cooperation the CERN-IT for use of DDV by all the LHC experiments**

Micromegas
as candidate technology for beam dump profile
NTU_A, LAPP

Attractive features

- Can combine triggering and tracking function
- Required performance
  - Efficiency > 98%
  - $\sigma_{sp} \approx 100$ μm ($\angle_{impact} <$ 45 deg)
  - Good double track resolution
  - $\sigma_t <$ 5 ns
- Potential for going to larger areas: 1 m x 2 m

MICROMEGAS

Y.Giomataris, Ph. Rebourgeard, J.P Robert and G. Charpak
NIM A376 (1996) 29
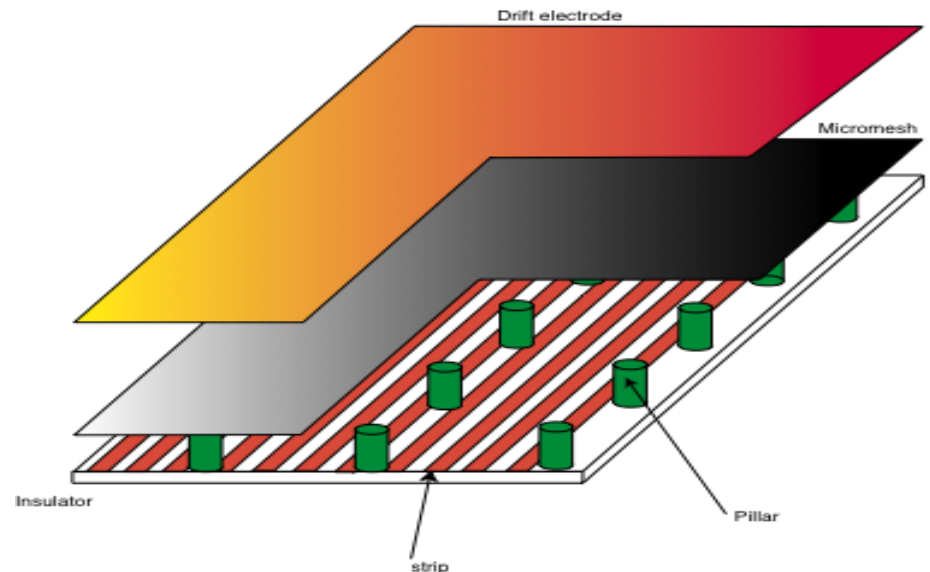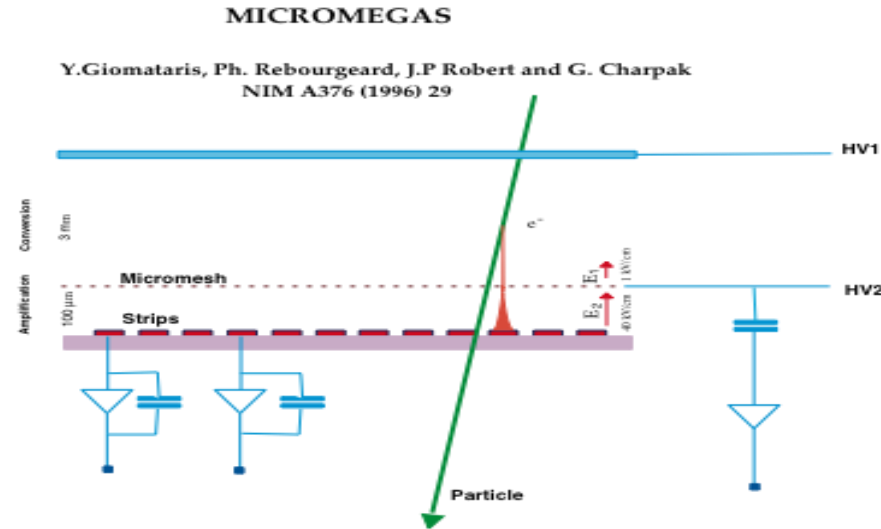
PROTON PHYSICS: NO BEAM

Energy:	0 GeV	I(B1):	0.00e+00	I(B2):	1.20e+09

BTVDD.689339.B1   Updated: 10:16:16
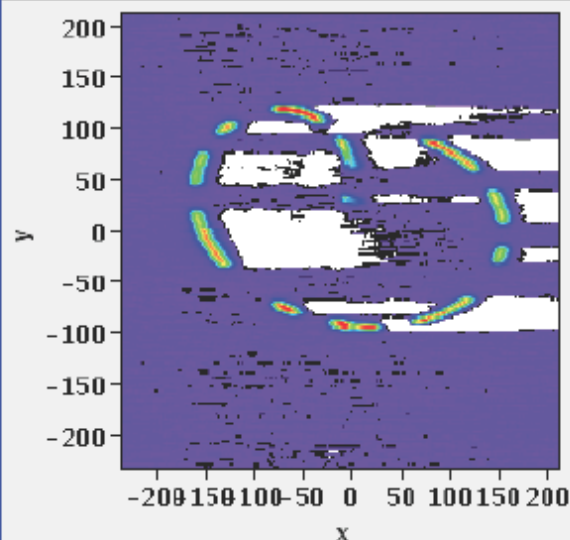
BTVDD.629339.B2   Updated: 10:16:16
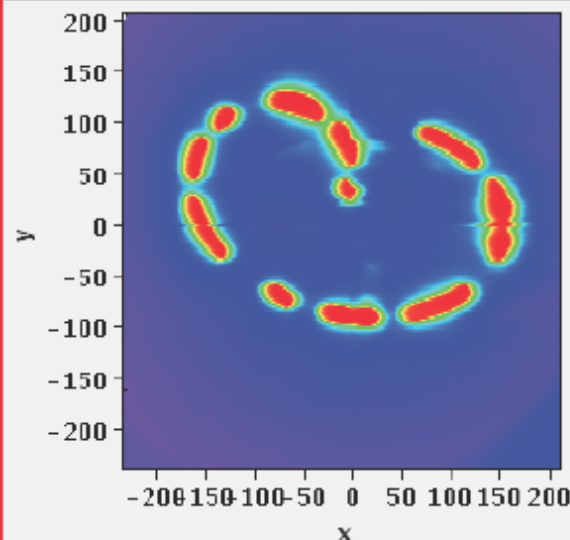
Comments 17-07-2011 11:01:58 :

Beams dumped by loss of a patrol

We will have to repatrol Point 4

next fill with 1092 bunches/beam

BIS status and SMP flags	B1	B2
Link Status of Beam Permits	true	true
Global Beam Permit	false	false
Setup Beam	false	false
Beam Presence	false	false
Moveable Devices Allowed In	false	false
Stable Beams	false	false

AFS: 50ns_1092b+1small_1042_35_1008_108bpi   PM Status B1   ENABLED   PM Status B2   ENABLED

OUR POSSIBLE CONTRIBUTION TO THE ALARA PROJECT

CERN – ATLAS

20/5/2011

... AND TO CLIC/CTF3 ??

Speakers

Soukoulias Petros	**Katsikas Serafeim**
President of Advisor Board	*Director of R&D Dpt.*
spertos@prisma.gr	sekat@prisma.gr

Scalable Readout System (SRS)

- Case identification: a flexible, modular readout system for multi channel detector systems based on widely used industry standards for a wide range of applications

- Market needs and user requirements for detector readout systems:
  - Modular setup of user specific detector systems
  - Support of widely used readout ASICs
  - Maximum use of industry standards
  - Programmable architectures and trigger schemes
  - Easy to use, reliable, cost efficient

- **Problem**: No One-Size-Fits-All solution available on the market matching all needs of multi channel detector readout systems
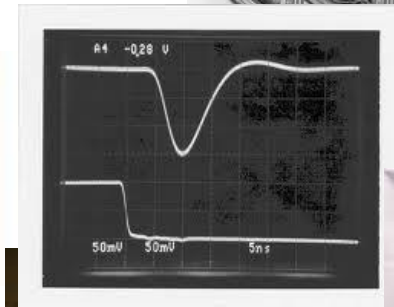
Scalable Readout System (SRS)

- SRS currently "handcrafted" and provided at cost by CERN
  - Strong interest driven by RD51 (and others)
  - Very limited production capability
  - No financial benefits, thus no funding for SRS development
- Current "market perspectives" for SRS:
  - 15 – 20 laboratories in RD51
- Assess interest from industry:
  - Outsource SRS production (simple purchase contract)
  - Development towards a SRS product (TT project)
- Current status:
  - Contacts with 2 companies (1 product development, 1 SRS production)
  - Access conditions and support
  - **FIRST RPOTOTYPES JAN-FEB 2012**

RD51 scalable architecture
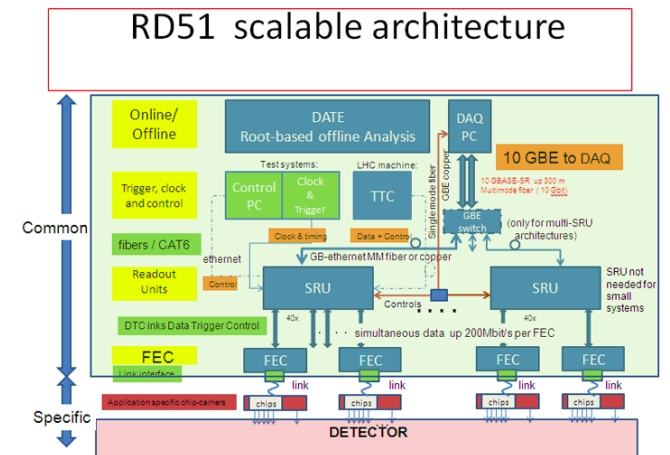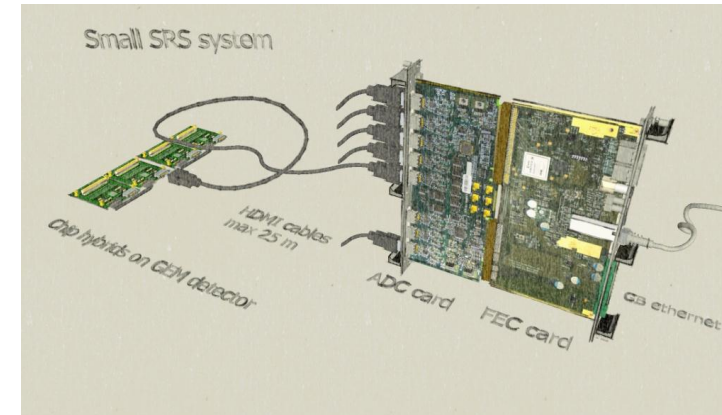
2. Applications & Transfer Technology

- **Proton Therapy**

E.N. Gazis
LOCMAF : a **LO**w **C**ost **M**ulti-use **A**ccelerator **F**acility for medical applications
Invited talk @ PHYSICS ON HEALTH, CERN, 2-4 Feb 2009

Marianna Kydonieos (NTUA, Diploma Thesis, 2011)
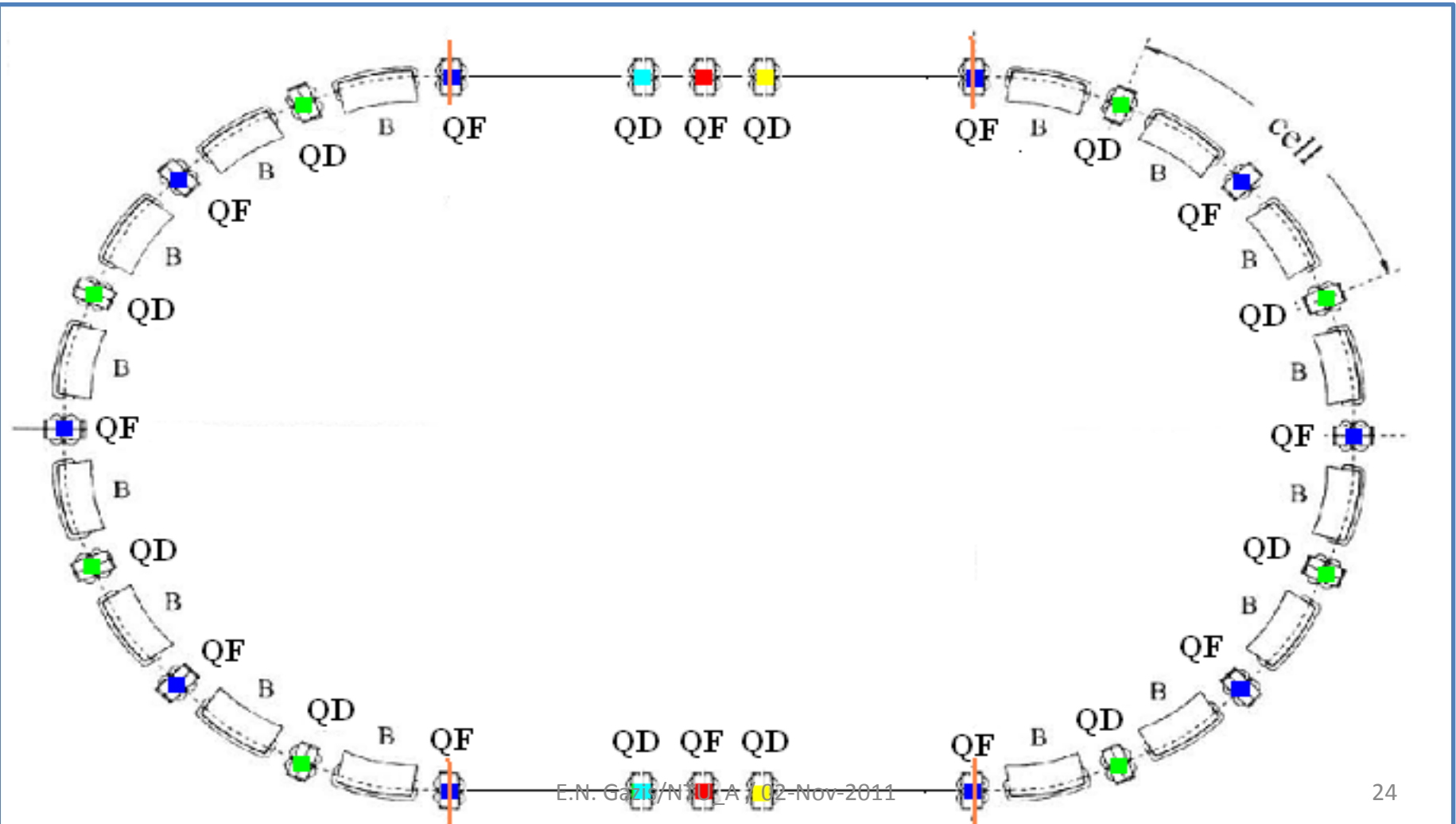Epidemiology of cancer and Design of a medical synchrotron

Eleni Sagia (NTUA, Diploma 2010 & MSc Thesis 2012)
Monte Carlo simulation for the ion beam absorption by human tissue and iron shield for the optimum shielding furing the proton therapy

- **TT-Network-Greek Industries**
  NTUA : Greek node partner

FINAL LATTICE

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Welcome to HEPTech

Technologies developed for fundamental research in particle, astro-particle and nuclear physics have an enormous impact on our everyday lives. To push back scientific frontiers in these fields requires innovation: new ways to detect one signal amongst a wealth of data, new techniques to sense the faintest signals, new detectors that operate in hostile environments and new engineering solutions that strive to improve on the best.

The scientific techniques and high-tech solutions developed by high energy physics can help address a wide range of real challenges faced by industry and society - from developing more effective medical imaging and cancer diagnosis from positron emission tomography techniques, to inventing the next generation of solar panels from ultra-high vacuum technologies.

HEPTech is the high energy physics technology transfer network (TTN). Bringing together leading European high energy physics research institutions, it provides academics and industry with a single point of unrivalled access to the unique skills, capabilities, technologies and R&D opportunities of the high energy physics community in a highly collaborative open-science environment.

Events

4. Progress

Greek-CLIC/CTF3 MoU 2009-2011

1.   Three Greek teams : NTU_A
                                Univ. of Patras
                                DUTH

2   2009:
           2 Summer Students,
           1 project

Greek-CLIC/CTF3 MoU 2011-2015

1.   Three Greek teams : NTU_A
                                Univ. of Patras
                                DUTH

PLUS Associated Institutions:
- Athens School of Economic, Dept. Informatics
- NCSR "Demokritos", Inst. of Nuclear Physics
- Technological Institute of Education of Kavala, Dept. of Electric & Computing Eng
- PRISMA ELECTRONICS SA

2   2011:
- 4 Ph.D. Students
- 3 M.Sc. Students
- 6 Technical Students
- Many Summer Students,
- 4 projects

4. Progress

Greek-CLIC/CTF3 MoU 2011-2015

Three Greek teams

1. NTU_A

Prof. Theodoros Alexopoulos/Dept. of HEP

Prof. Yorgos Tsipolitis/Dept. of HEP

Prof. Stavros Kourkoulis/Dept. of Mechanic Studies & Materials

Prof. Evangelos Chinis/Dept. of Nuclear Engineering

2. Univ. of Patras

Prof. Vassilios Kostopoulos/Dept. of Mechanical & Aeronautics Engineering

Prof. Dimitrios Toumbakaris/Dept of Electrical & Computing Engineering

3. Democritus Univ. of Thrace

Prof. Ioannis Andreadis/Dept. of Electrical & Computing Engineering

PLUS Associated Institutions:

- Athens School of Economic, Dept. Informatics. Prof. Th. Apostolopoulos
- NCSR "Demokritos", Inst. of Nuclear Physics, Prof. Sot. Charissopoulos
- Technological Institute of Education of Kavala, Dept. of Electric & Computing Eng, Prof. L. Maggafas
- PRISMA ELECTRONICS SA, Mr. P. Soukoulias

Greek HEP TEAMS

LOCATION	TEAMS	Particle Physics	CLIC CTF3
ATHENS	NTU-A	X	X
	NCU-A	X	--
	DEMOKRITOS	X	X
	Athens School ECONOMICS	--	X
NORTH GREECE	Aristotle Univ. THESSALONIKI	X	--
	Demokritus Univ. THRACE (Xanthi)	--	X
	TEI-KAVALA	--	X
WEST	IOANNINA	X	--
EAST	AEGEAN CHIOS Island	X	
SOUTH	PATRAS	X	X
	OPEN UNIV.	X	--
	CRETE	X	--

Greek firms cooperating at CERN with ATLAS, CMS, RD-51, ISOLDE, etc.

4. Conclusions

1. The Greek teams are cooperating under the coordination of NTUA as ONE group to the CLIC/CTF3 and other accelerator technology projects.

1. Our vision is covered by realizing our targets for science, technology and innovation improvement

1. Our plans are focused and combined with the perspectives of our future path of the Greek team and the new colleagues joining us