

# PROCEEDINGS

OF THE TOPICAL WORKSHOP ON ELECTRONICS FOR  
PARTICLE PHYSICS

# TWEPP-09

*PARIS, FRANCE, 21-25 SEPTEMBER 2009*

Organized by

CNRS/IN2P3: Centre National de la Recherche Scientifique /  
Institut National de Physique Nucléaire et Physique des Particules  
UPMC: Université Pierre et Marie Curie Paris 6  
LAL: Laboratoire de l'Accélérateur Linéaire, Orsay  
LPNHE: Laboratoire de Physique Nucléaire et des Hautes Energies, Paris  
OMEGA: Orsay Microelectronics Groups Associated, Orsay

with support from CERN, the European Organization for Nuclear Research

Full workshop programme on the Web  
<http://indico.cern.ch/event/twepp09>

## **ABSTRACT**

The purpose of this workshop was to present original concepts and results of research and development for electronics relevant to particle physics experiments as well as accelerator and beam instrumentation at future facilities; to review the status of electronics for running experiments; to identify and encourage common efforts for the development of electronics; and to promote information exchange and collaboration in the relevant engineering and physics communities.



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## ORGANIZATION

The TWEPP-09 workshop was held from **21-25 September 2009** in the Institut des Cordeliers, Paris, France and was organized by five French institutions, with support from CERN:

CNRS/IN2P3: Centre National de la Recherche Scientifique /  
Institut National de Physique Nucléaire et Physique des Particules  
UPMC: Université Pierre et Marie Curie Paris 6  
LAL: Laboratoire de l'Accélérateur Linéaire, Orsay  
LPNHE: Laboratoire de Physique Nucléaire et des Hautes Energies, Paris  
OMEGA: Orsay Microelectronics Groups Associated, Orsay

### Local Organizing Committee

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| Hervé LEBBOLO                  | LPNHE     |
| Gisèle MARTIN-CHASSARD         | OMEGA-LAL |
| Nathalie SEGUIN-MOREAU         | OMEGA-LAL |
| Laurent SERIN                  | LAL       |

### Scientific Committee

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| Allain GONIDEC          | CERN                                 |
| Geoff HALL              | Imperial College, London             |
| Magnus HANSEN           | CERN                                 |
| Alessandro MARCHIORO    | CERN                                 |
| John OLIVER             | Harvard University, Cambridge, Mass. |
| Emilio PETROLO          | INFN, Rome                           |
| Steve QUINTON           | RAL                                  |
| Wesley SMITH            | University of Wisconsin              |
| Christophe DE LA TAILLE | OMEGA-LAL                            |
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### Scientific Committee Assistant and Proceedings Editor

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| Evelyne DHO | CERN |
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## OVERVIEW

The purpose of the workshop was

- to present original concepts and results of research and development for electronics relevant to particle physics experiments as well as accelerator and beam instrumentation at future facilities
- to review the status of electronics for running experiments
- to identify and encourage common efforts for the development of electronics
- to promote information exchange and collaboration in the relevant engineering and physics communities.

The main subjects of the workshop were recent research and developments in the following areas relevant to particle physics experiments:

- Electronics for Particle Detection, Triggering and Acquisition Systems
- Electronics for Accelerator and Beam Instrumentation
- Custom Analog and Digital Circuits
- Programmable Digital Logic Applications
- Optoelectronic Data Transfer and Control
- Packaging and Interconnect Technologies
- Radiation and Magnetic Tolerant Components and Systems
- Production, Testing and Reliability
- Power Management and Conversion
- Grounding, Shielding and Cooling
- Design Tools and Methods

The welcome address was given by **François VASEY** chairperson of the programme committee, and the introduction was given by **Christophe de la TAILLE**.

A topical session on low power designs and techniques took place on Thursday afternoon, with two invited contributions.

Three dedicated working group meetings were held, one on microelectronics, one on optoelectronics, and one on power conversion and management.

An optional tutorial took place on the Friday afternoon following the workshop. Michael Schulte, Shuvra Bhattacharyya and Anthony Gregerson lectured on FPGA Tools and Techniques for High Performance Digital Systems.

## **PLENARY SESSIONS AND INVITED TALKS**

### Opening Plenary Session 1 – Chaired by François Vasey

Research activities at Pierre & Marie Curie University  
Status and Perspective of Research at IN2P3  
Micro-Electronics at IN2P3

INDELICATO, Paul  
AUGE, Etienne  
DE LA TAILLE, Christophe

### Opening Plenary Session 2 – Chaired by Guy Wormser

The future of the LHC programme and machine  
HEP experiments in Japan: The Next Generation  
ILC-CLIC

BERTOLUCCI, Sergio  
ITO, Ryosuke  
KLUGE, Alexander

### Plenary Session 1 – Chaired by Geoff Hall

Experiment protection at the LHC and damage limits in  
LHC(b) silicon detectors

FERRO-LUZZI, Massimiliano

### Plenary Session 2 – Chaired by Alessandro Marchioro

Low Power analog Design in Scaled CMOS Technologies

BASCHIROTTO, Andrea

### Plenary Session 3 – Chaired by Wesley SMITH

Buses and Boards, making the right choice

GIPPER, Jerry

### Plenary Session 4 – Chaired by Philippe FARTHOUAT

Low Noise Design for Large Detectors

JOHNSON, Marvin

### Plenary Session 5 – Chaired by François VASEY

Key technologies for present and future optical networks

ANTONA, Jean-Christophe

### Plenary Session 6 – Chaired by Magnus HANSEN

Recent Advances in Architectures and Tools for Complex  
FPGA-based Systems

SCHULTE, Michael

### Plenary Session 7 – Report from Working Groups, Chaired by Allain Gonidec

## **TOPICAL SESSION**

### Chaired by John OLIVER

Low Power SoC Design  
Two-Phase Cooling of Targets and Electronics for Particle Physics  
Experiments

PIGUET, Christian  
THOME, John Richard



## **PARALLEL SESSIONS**

Parallel sessions A were chaired by

CHRISTIANSEN, Jorgen  
DE LA TAILLE, Christophe  
MARCHIORO, Alessandro  
MUSA, Luciano  
PETROLO, Emilio  
SMITH, Wesley

Parallel sessions B were chaired by

CHRISTIANSEN, Jorgen  
FARTHOUAT, Philippe  
GONIDEC, Alain  
HALL, Geoff  
QUINTON, Stephen  
VASEY, François  
WIJNANDS, Thijs  
WYLLIE, Kenneth  
YAREMA, Ray

## **POSTERS**

John OLIVER and Ray YAREMA chaired the posters session

## **TUTORIAL**

Michael SCHULTE, Shuvra BHATTACHARYYA, and Anthony GREGERSON lectured on FPGA Tools and Techniques for High Performance Digital Systems

## **INDUSTRIAL EXHIBITION**

C.A.E.N, Viareggio, Italy  
PHYSICAL Instruments, Le Perreux sur Marne, France

## **SPONSORS**

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## **NEXT WORKSHOP**

The next workshop will take place in Aachen, Germany, on 20–24 September 2010