

3rd International Summer School on INtelligent Signal Processing for FrontlEr Research and Industry

Monday 14 September 2015 - Friday 25 September 2015

Hamburg



Book of Abstracts

Contents

Lunch	1
Coffee	1
Welcome Cocktail (and Sign-Up for the Labs)	1
Welcome	1
Increasing intelligence on Astrophysics Instruments: the Gravitational Waves experiments as an example case (Part I)	1
Increasing intelligence on Astrophysics Instruments: the Gravitational Waves experiments as an example case (Part II)	1
IMAGING TECHNOLOGY FOR TRANSLATIONAL MEDICINE	1
Lecture Tittle to be announced	1
VERTICAL INTEGRATION in NEW DEVICES	2
New Calorimetry techniques and Intelligent Signal Processing: FRONT-END ELECTRONICS in IMAGING CALORIMETRY	2
Signal Processing on Detectors filled with Noble Gas: The Direct search for Dark Matter and Long Baseline Neutrino experiments	2
On-detector High Signal Processing for next generation HEP trackers : TRACK TRIGGERING, NO	2
PROCESSING the SIGNALS from PIXEL DETECTORS in X-RAY IMAGING at FELs	2
Signal Processing for Gravitational Waves Experiments	2
NEW FRONT-END ASIC DESIGN(s) for next generation of pixel based devices : How to handle with High granularity, high rate & high performances in the HEP case (HL-LHC)	3
TECHNOLOGICAL CHALLENGES for REALTIME PROCESSING of PIXEL INFORMATION	3
Large tracking detectors for the HL-LHC with novel trigger systems - ATLAS case	3
RECENT ADVANCES in SILICON PHOTONICS - part 1	3
RECENT ADVANCES in SILICON PHOTONICS - part 2	3

DATAFLOW: current and future data-transmission applications in the data-acquisition systems at the LHC	3
DATA TRANSMISSION CHALLENGES & NEEDS for FRONTIER TELECOM APPLICATIONS in MEDICAL IMAGING	3
Data transmission challenges and needs for Frontier applications in Astro-particles: the AMS spatial case	4
HIGH PERFORMANCE and MASSIVE PARALLEL COMPUTING needs and challenges for Astrophysics: the gravitational waves experiments case	4
VDSM[Pleaseinsertintopreamble]HOW DEEP ? : benefits and limitations	4
Massive Parallel and High Performance Computing needs in HEP: new challenges and trends	4
The LISA PATHFINDER	4
Test systems in HEP: Lab-based test benches and test beams	4
EXAMPLES of SPECIFIC TEST SYSTEMS For ASTROPHYSICS	4
Medical Imaging Applications and Demonstrators: Challenges in PET Imaging	4
Safety Course	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	5
Labs	6
Labs	6
Labs	6
DISCUSSION SESSION	6
COLLOQUIUM on LOOKING FOR THE DARK MATTER HIDING IN THE UNIVERSE	6
DISCUSSION SESSION	6
Discussion session	6

COLLOQUIUM on THE EUROPEAN X-RAY LASER PROJECT XFEL: scientific and industrial impacts and perspectives	6
INSTRUMENTATION THE GREAT ENABLER	6
COLLOQUIUM on FUTURE COLLIDERS	7
Registration	7
The LISA PATHFINDER	7
New challenges and Needs on Massive Parallel and High Performance Computing (cont'd): the New Particle Physics Experiments case	7
PARTICLE DETECTORS as MONITORS for CANCER THERAPY	7
PARTICLE DETECTORS as MONITORS for CANCER THERAPY	7
VDSM...HOW DEEP ? : benefits and limitations	7
Introductory Tutorial To New Automata Processors, Part1	8
Introductory Tutorial To New Automata Processors, Part 2	8
PET & PET IMAGE RECONSTRUCTION	8
Development of a Data Compressor for the CMS Phase II Pixel Detector	8
Development of Coincidence Sorter and Communication Protocol between the Boards on PET System	8
The Use of Gold Nanoparticles and Spectroscopic Detectors in Contrast-enhanced Digital Mammography	8
Circuit Data Flow (CIDAF): A generic, flexible, discrete-time simulator	8
Microwave Kinetic Inductance Detectors for Astronomy	8
Multi-Grid High Gas Proportional Scintillation Counter: A New Approach	9
Development of an Intelligent Platform Management Controller for the Pulsar IIB	9
Data Sourcing Firmware for CMS L1 Tracking Trigger	9
Simulations, Testing and Results for the Pixelization of LYSO Crystals for Gamma Detectors Using the Sub-Surface Laser Engraving Techniques	9
Integration of the Camera Backplane of the Gamma Cherenkov Telescope for the Cherenkov Telescope Array	9
Search for Narrow High Mass Resonances Decaying to Z and Higgs Bosons	9
Simulation of a Silicon Sensor Edge-on Illuminated with an X-Ray Beam	9
SiPM-MAROC gamma-camera prototype with Monolithic NaI(Tl) scintillator	9
2.5Gb/s Optical Wireless Communication System for Particle Detectors in High Energy Physics	10

Light Weight Radiation Sensors	10
Muon Tomography	10
Edge Studies on Sensors for the LHCb VELO Upgrade	10
LHCb VELO Upgrade	10
A Pattern Recognition Mezzanine Based on Associative Memory FPGA Technology for L1 Track Triggering at HL-LHC	10
NEXT: The Front-End Electronics for the 1.8-kchannel SiPM Tracking Plane in the NEW Detector	10
Demonstrator Plans for FPGA-Based L1 Track-Finding with Hough Transform	11
Development of Novel Pixel Sensors based on 3D CMOS Technology for Tracking Devices	11

0

Lunch

1

Coffee

2

Welcome Cocktail (and Sign-Up for the Labs)

3

Welcome

Corresponding Author(s): jan.louis@desy.de

Introduction to Signal Processing in Astrophysics, Medical Physics and Particle Physics / 4

Increasing intelligence on Astrophysics Instruments: the Gravitational Waves experiments as an example case (Part I)

Corresponding Author(s): shipsey@physics.ox.ac.uk

Introduction to Signal Processing in Astrophysics, Medical Physics and Particle Physics / 5

Increasing intelligence on Astrophysics Instruments: the Gravitational Waves experiments as an example case (Part II)

Introduction to Signal Processing in Astrophysics, Medical Physics and Particle Physics / 6

IMAGING TECHNOLOGY FOR TRANSLATIONAL MEDICINE

Prof. XIE, Qingguo¹

¹ *Huazhong University of Science and Technology, CN*

Introduction session on Advanced Very Deep Sub Micron CMOS technologies, 3D technologies and Industry trends / 7

Lecture Tittle to be announced

Introduction session on Advanced Very Deep Sub Micron CMOS technologies, 3D technologies and Industry trends / 8

VERTICAL INTEGRATION in NEW DEVICES

This is the first lecture dedicated to the VDSM and 3D vertical interconnects, the second one dedicated specifically to the VDSM technology will be given on September 23, by G. Deptuch (FNAL)

Intelligent Front-End Processing on Instruments / 9

New Calorimetry techniques and Intelligent Signal Processing: FRONT-END ELECTRONICS in IMAGING CALORIMETRY

Corresponding Author(s): taille@in2p3.fr

Intelligent Front-End Processing on Instruments / 10

Signal Processing on Detectors filled with Noble Gas: The Direct search for Dark Matter and Long Baseline Neutrino experiments

Corresponding Author(s): marc.schumann@lhep.unibe.ch

The focus is on the experiments using Noble gases.

Intelligent Front-End Processing on Instruments (cont'd) / 11

On-detector High Signal Processing for next generation HEP trackers : TRACK TRIGGERING, NO

Co-author(s): TBA

Corresponding Author(s): paula.collins@cern.ch

Intelligent Front-End Processing on Instruments (cont'd) / 12

PROCESSING the SIGNALS from PIXEL DETECTORS in X-RAY IMAGING at FELs

Corresponding Author(s): lodovico.ratti@unipv.it

Intelligent Front-End Processing on Instruments (cont'd) / 13

Signal Processing for Gravitational Waves Experiments

Intelligent Silicon Trackers: Pixels and large area Si Trackers / 14

NEW FRONT-END ASIC DESIGN(s) for next generation of pixel based devices : How to handle with High granularity, high rate & high performances in the HEP case (HL-LHC)

Intelligent Silicon Trackers: Pixels and large area Si Trackers / 15

TECHNOLOGICAL CHALLENGES for REALTIME PROCESSING of PIXEL INFORMATION

Intelligent Silicon Trackers: Pixels and large area Si Trackers / 16

Large tracking detectors for the HL-LHC with novel trigger systems - ATLAS case

Corresponding Author(s): ingrid.gregor@desy.de

Data transmission challenges, new trends in Telecom ; the interconnected worlds / 17

RECENT ADVANCES in SILICON PHOTONICS - part 1

VIVIEN, Laurent¹

¹ *Institut d'Electronique Fondamentale - CNRS, Si photonics, University of Paris Sud, FR*

Data transmission challenges, new trends in Telecom ; the interconnected worlds / 18

RECENT ADVANCES in SILICON PHOTONICS - part 2

Data transmission challenges and needs for Frontier applications in Astrophysics and Particle Physics / 19

DATAFLOW: current and future data-transmission applications in the data-acquisition systems at the LHC

Corresponding Author(s): wainer.vandelli@cern.ch

Data transmission challenges and needs for Frontier applications in Astrophysics and Particle Physics / 20

DATA TRANSMISSION CHALLENGES & NEEDS for FRONTIER TELECOM APPLICATIONS in MEDICAL IMAGING

Data transmission challenges and needs for Frontier applications in Astrophysics and Particle Physics / 21

Data transmission challenges and needs for Frontier applications in Astro-particles: the AMS spatial case

Massive Parallel and High Performance Computing (MPC-HPC) / 22

HIGH PERFORMANCE and MASSIVE PARALLEL COMPUTING needs and challenges for Astrophysics: the gravitational waves experiments case

Corresponding Author(s): badri.badrikrishnan@gmail.com

Massive Parallel and High Performance Computing (MPC-HPC) / 23

VDSM . . . HOW DEEP ? : benefits and limitations

24

Massive Parallel and High Performance Computing needs in HEP: new challenges and trends

25

The LISA PATHFINDER

New Test Bench and Demonstrators developed for Future Experiments/Projects (cont'd) / 26

Test systems in HEP: Lab-based test benches and test beams

Corresponding Author(s): hendrik.jansen@desy.de

New Test Bench and Demonstrators developed for Future Experiments/Projects (cont'd) / 27

EXAMPLES of SPECIFIC TEST SYSTEMS For ASTRO-PHYSICS

New Test Bench and Demonstrators developed for Future Experiments/Projects (cont'd) / 28

Medical Imaging Applications and Demonstrators: Chal-

Challenges in PET Imaging

Co-author(s): VAQUERO, Juan Jose ¹

¹ *University Carlos III, Madrid*

Safety Course and Presentation of Labs / 29

Safety Course

Safety Course and Presentation of Labs / 30

Labs

Lab Sessions / 31

Labs

Lab Sessions / 32

Labs

Lab Sessions / 33

Labs

Lab Sessions / 34

Labs

Lab Sessions / 35

Labs

Lab Sessions / 36

Labs

Lab Sessions / 37

Labs

Lab Sessions / 38

Labs

Lab Sessions / 39

Labs

Lab Sessions / 40

Labs

Discussion/Public Lecture / 41

DISCUSSION SESSION

Focus will be on the lectures given on September 15 and 16.

Discussion/Public Lecture / 42

COLLOQUIUM on LOOKING FOR THE DARK MATTER HIDING IN THE UNIVERSE

Corresponding Author(s): tobias.haas@xfel.eu

Discussion/Public Lecture / 43

DISCUSSION SESSION

Focus on the Lectures given on September 17 and 18.

Discussion/Public Lecture / 44

Discussion session

Focus on the saturday morning lectures; as for the other discussion sessions of the school the attendance is free.

Discussion/Public Lecture / 45

COLLOQUIUM on THE EUROPEAN X-RAY LASER PROJECT XFEL: scientific and industrial impacts and perspectives

Corresponding Author(s): harald.sinn@desy.de

Discussion/Public Lecture / 46

INSTRUMENTATION THE GREAT ENABLER

(Lecture moved from the first day)

Discussion/Public Lecture / 47

COLLOQUIUM on FUTURE COLLIDERS

Corresponding Author(s): b.foster@physics.ox.ac.uk

Registration / 48

Registration

49

The LISA PATHFINDER

Massive Parallel and High Performance Computing / 50

New challenges and Needs on Massive Parallel and High Performance Computing (cont'd): the New Particle Physics Experiments case

New Test Bench and Demonstrators developed for Future Experiments/Projects / 51

PARTICLE DETECTORS as MONITORS for CANCER THERAPY

Corresponding Author(s): riccardo.faccini@roma1.infn.it

New Test Bench and Demonstrators developed for Future Experiments/Projects (cont'd) / 55

PARTICLE DETECTORS as MONITORS for CANCER THERAPY

Corresponding Author(s): riccardo.faccini@roma1.infn.it

Introduction session on Advanced Very Deep Sub Micron CMOS technologies, 3D technologies and Industry trends / 57

VDSM...HOW DEEP ? : benefits and limitations

Note that due to Lecturer's time constraint this lecture has been moved of date and time.

Massive Parallel and High Performance Computing (MPC-HPC) / 61

Introductory Tutorial To New Automata Processors, Part1

This Tutorial serves as introduction to the Lab sessions initiating to this new type of processors.

Massive Parallel and High Performance Computing (MPC-HPC) / 62

Introductory Tutorial To New Automata Processors, Part 2

This Tutorial serves as introduction to the Lab sessions initiating to this new type of processors.

Massive Parallel and High Performance Computing / 66

PET & PET IMAGE RECONSTRUCTION

SPECIAL POSTER SESSION / 67

Development of a Data Compressor for the CMS Phase II Pixel Detector

Corresponding Author(s): stamatios.poulios@pi.infn.it

SPECIAL POSTER SESSION / 68

Development of Coincidence Sorter and Communication Protocol between the Boards on PET System

Corresponding Author(s): eleftheria.kostara@pi.infn.it

SPECIAL POSTER SESSION / 69

The Use of Gold Nanoparticles and Spectroscopic Detectors in Contrast-enhanced Digital Mammography

Corresponding Author(s): l.dummott@surrey.ac.uk

SPECIAL POSTER SESSION / 70

Circuit Data Flow (CIDAF): A generic, flexible, discrete-time simulator

Corresponding Author(s): luigi.calligaris@stfc.ac.uk

SPECIAL POSTER SESSION / 71

Microwave Kinetic Inductance Detectors for Astronomy

SPECIAL POSTER SESSION / 72

Multi-Grid High Gas Proportional Scintillation Counter: A New Approach

Corresponding Author(s): andre.cortez@cern.ch

SPECIAL POSTER SESSION / 73

Development of an Intelligent Platform Management Controller for the Pulsar IIB

Corresponding Author(s): tcpaiva@umass.edu

SPECIAL POSTER SESSION / 74

Data Sourcing Firmware for CMS L1 Tracking Trigger

Corresponding Author(s): tcpaiva@umass.edu

SPECIAL POSTER SESSION / 75

Simulations, Testing and Results for the Pixelization of LYSO Crystals for Gamma Detectors Using the Sub-Surface Laser Engraving Techniques

SPECIAL POSTER SESSION / 76

Integration of the Camera Backplane of the Gamma Cherenkov Telescope for the Cherenkov Telescope Array

Corresponding Author(s): andrea.defranco@astro.ox.ac.uk

SPECIAL POSTER SESSION / 77

Search for Narrow High Mass Resonances Decaying to Z and Higgs Bosons

Corresponding Author(s): cesar.augusto.bernardes@cern.ch

SPECIAL POSTER SESSION / 78

Simulation of a Silicon Sensor Edge-on Illuminated with an X-Ray Beam

Corresponding Author(s): michele.doni11@gmail.com

SPECIAL POSTER SESSION / 79

SiPM-MAROC gamma-camera prototype with Monolithic NaI(Tl) scintillator

Corresponding Author(s): filippovdima@rambler.ru

SPECIAL POSTER SESSION / 80

2.5Gb/s Optical Wireless Communication System for Particle Detectors in High Energy Physics

Corresponding Author(s): w.ali@sssup.it

SPECIAL POSTER SESSION / 81

Light Weight Radiation Sensors

Corresponding Author(s): chiara.giroletti@bristol.ac.uk

SPECIAL POSTER SESSION / 82

Muon Tomography

Corresponding Author(s): chiara.giroletti@bristol.ac.uk

SPECIAL POSTER SESSION / 83

Edge Studies on Sensors for the LHCb VELO Upgrade

Corresponding Author(s): e.dallocco@nikhef.nl

SPECIAL POSTER SESSION / 84

LHCb VELO Upgrade

Corresponding Author(s): emma.buchanan@bristol.ac.uk

SPECIAL POSTER SESSION / 85

A Pattern Recognition Mezzanine Based on Associative Memory FPGA Technology for L1 Track Triggering at HL-LHC

Corresponding Author(s): giacomo.fedi@pi.infn.it

SPECIAL POSTER SESSION / 86

NEXT: The Front-End Electronics for the 1.8-kchannel SiPM Tracking Plane in the NEW Detector

Corresponding Author(s): javier.rodriquez@ific.uv.es

SPECIAL POSTER SESSION / 87

Demonstrator Plans for FPGA-Based L1 Track-Finding with Hough Transform

Corresponding Author(s): davide.cieri@stfc.ac.uk

SPECIAL POSTER SESSION / 88

Development of Novel Pixel Sensors based on 3D CMOS Technology for Tracking Devices

Corresponding Author(s): matteo.vignetti@insa-lyon.fr