Short CV and Abstracts for the tutorials (NDIP11)

1/ **Thomas Patzak**, Interaction Particle Matter, APC - Paris 7

Abstract:

The tutorial will cover the interaction of particles and photons with matter. The first part concentrates on the theoretical basis of what happens when particles or photons go through matter. In particular the energy loss by ionization and Cherenkov radiation will be treated. In the next chapter the interaction of photons with matter will be exposed. Finally detector systems and applications are discussed.

Lecturer:

Prof. Dr. Th. Patzak, full Professor at University of Paris Diderot.

Scientific activities in experimental particle physics, neutrino physics and high energy cosmic rays.

1995 thesis at CERN in the CHORUS Neutrino oscillation experiment, 1995 to 1999 postdoctoral position at Collège de France, Paris, 1999 to 2000 research professor at Tufts University, Boston and since 2000 Professor at the University Paris Diderot.

1992 Winner of the prize of the German academy of science for the development of optical readout systems for fibers with image intensifiers and CCD cameras

1996 design and realization of a generator of single photons with a tunable time difference (0 ns to several hundreds of ns) to study pile-up in wire chambers

1997 first observation of the signal introduced by the electron movement in Micromegas detectors together with JC Vanel.

2000 first experimental evidence for the tau neutrino (DONUT experiment)

Since 2000 head of the photo detection lab at APC

Since 2001 member of the EUSO / JEM-EUSO collaboration

1999 to 2010 Member of the MINOS neutrino oscillation experiment

Since 2008 president of the scientific council of the physics department of the university Paris Diderot.

Since 2008 head of the French CNRS groups in LAGUNA and LAGUNA-LBNO

Since 2011 Chair of the scientific board of LAGUNA-LBNO (European design study for future large scale neutrino detectors: 300 physicists, 13 countries, 41 institutions and industrial partners)

2/ **Rémi Barbier**, Photodetection, University Claude Bernard - Lyon 1

Abstract:

The tutorial session on photo-detectors will cover vacuum tubes, solid-state sensors and hybrid technologies. The main objective of this session is to give a large overview of the detection principles of each category and to give the key points to understand the new developments in this domain. The perfect photo-detector does not exist! So it is important to identify the technical parameters entering in each detection process and to understand what can be expected on the different figures of merit such as spatial and temporal resolutions, efficiency, sensitivity, noise and dead time?

The particular case of single-photon detection and localization will be treated in more details.

Lecturer:

Rémi Barbier is an assistant professor at the University Claude Bernard Lyon 1. He is involved in R&D on photo-detectors at the Nuclear Physics Institute of Lyon IN2P3/CNRS.

After a Ph.D thesis in theoretical nuclear physics, he analyzed the data taken by the DELPHI experiment at LEP/CERN.

Since the end of LEP experiments, his main activity is devoted to R&D in photo-detection and more particularly in low light level imaging with Hybrid technologies (ebCMOS). His subjects of interest are single-photon detection, data acquisition, fast low-light fluorescence imaging in nano-photonics, back-side-illuminated CMOS.

3/ **Jean-François Genat**, Electronics, LPNHE, Paris

Abstract:

After a short introduction presenting the use of photodetectors in the contexts of High Energy Physics, Nuclear Physics, Astroparticle and Medical applications, the basic properties of the most typical photodetectors output signals are reviewed. The various electronics signal processing techniques, analog and digital, will be evaluated in specific photodetector cases, as well as the available technological choices for their practical implementations.

Particular emphasis will be placed on the integration of the readout electronics for solid state and vacuum photon counting devices, monolithic or multi-layer (3D) pixel structures, multi-ranging techniques in the case of calorimetry, and timing extraction for Time Of Flight detectors. In each case, recent examples will be presented and a set of useful links will be provided.

Lecturer:

Jean-Francois Genat is active in the field of Instrumentation for High Energy Physics and Astrophysics at Centre National de la Recherche Scientifique, France, since 1975 as a research engineer. He contributed to the High Energy Physics experiments at the Large Electron Positron accelerator at CERN (Geneva, Switzerland) in the early eighties, introducing pattern finding architectures and sub-nanosecond timing integrated circuits, implemented in bipolar and CMOS technologies.

He has been involved recently in the design of fast integrated electronics systems for large area photodetectors coupled to scintillating crystals, having in view Time of Flight measurements applied for instance to high energy particle detectors and Positron Emission Tomography cameras. He is also active presently on the design of pixel detectors electronics for the ATLAS experiment at the CERN Large Hadron Collider accelerator.

4/ **Image Processing**, Sandrine Pires, CEA, Saclay

Abstract:

The development of new innovative detectors is continuously driven by various fields of Physics, Biology or Medicine. To capitalize on these more and more accurate instruments, the development of new methods in image processing is crucial. The progress in instrumentation improves the quality of observations while the new developments in image processing make the image quality better and facilitate the analysis. The goal of this tutorial is to introduce image processing to experts in photodetection and make easier future interactions between these two communities. During this tutorial, I will present a range of image processing methods (filtering, deconvolution, inpainting, compressed sensing…) currently used to correct for instrumental and observational biases from earliest to up-to-date methods. This presentation will focus on the Astrophysics field that possesses a dynamic research area both in instrumentation and image processing. The same methods can easily be applied to others fields like Nuclear physics or Biology.

Lecturer:

Sandrine Pires is working at CEA-Saclay (France), Astrophysics department, since 2003. She is involved in the field of advanced signal and image processing applied to astronomical data analysis. Her researcher interests include multiscale methods, sparse representation and statistical methods in astrophysics. She is particularly involved in cosmological data analysis tools devoted to weak lensing or Cosmic Microwave Background for instance, in the frame of major international projects as Euclid, SparseAstro or Planck.