

# **Advanced UK Instrumentation Training 2022**

**Monday, April 25, 2022 - Friday, June 24, 2022**

## **Scientific Program**

The course programme currently reflects the interest/involvement of the UK silicon community, and is heavily focussed on semiconductor theory, simulation, experimental tools and applications.

## **Semiconductor theory**

Band theory 1

Band theory 2

Layout, guard rings, device calculations 1

Layout, guard rings, device calculations 2

Interaction of particles with matter 1

Interaction of particles with matter 2

Ramo-shockley theory

Radiation damage 1

Radiation damage 2

## **Electronics and DAQ**

General electronics, simple circuit calculations

Circuit theory, common topologies

Circuit design, noise and grounding

Amplifier designs (fast amplifiers, TDC)

Typical ASIC architectures

PCB layout

FPGA overview

Trigger + DAQ systems

## **Mechanics and cooling**

Mechanical structures 1

Mechanical structures 2

Thermal management 1

Thermal management 2

CAD and technical drawing

FE analysis tools

CAD walkthrough

## **Silicon fabrication and structures**

Silicon device fabrication 1

Silicon device fabrication 2

Silicon device fabrication 3

Silicon device fabrication 4

Device structures: planar and 3D sensors

Device structures: Gain layers (LGAD, SPAD, SiPM)

Device structures: Monolithic sensors

Transistor layout 250 - 28 nm, FinFETs

## **Experimental techniques**

Lab techniques: IV, CV, source measurements, x-ray measurements 1

Lab techniques: IV, CV, source measurements, x-ray measurements 2

Transient current techniques

Solid state techniques: DLTS, TSC

Testbeams 1

Testbeams 2

Irradiation 1

Irradiation 2

## **TCAD electric field and transport simulations**

TCAD introduction, getting started

SProcess planar sensor

SDevice planar sensor

SProcess 3D sensor

SDevice 3D sensor

SProcess monolithic sensor

SDevice monolithic sensor

Advanced features

## **Software tools**

PCB design (kicad) 1

PCB design (kicad)2

SPICE - electronics simulations (LTspice) 1

SPICE - electronics simulations (LTspice) 2

Monte-Carlo simulations (allpix squared) 1

Monte-Carlo simulations (allpix squared) 2

Testbeam reconstruction (corrvreckan) 1

Testbeam reconstruction (corrvreckan) 2

## Short topics

Photon science applications

Non-silicon semiconductors: Diamond

Non-silicon semiconductors: Diamond II

Other silicon devices: CCDs, Depfets, imaging sensors

Applications: Dosimetry, medical uses