Advanced UK Instrumentation Training 2024

April 22, 2024 to June 22, 2024

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)
PCB layout
Trigger + DAQ systems 1
Trigger + DAQ systems 2
FPGA overview

Mechanics and cooling

Mechanical structures 1
Mechanical structures 2
Thermal management 1
Thermal management 2

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 (corryvreckan) 1
Testbeam reconstruction (corryvreckan) 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