

IPIC Theme Information

<https://www.ipic.ie/research/>

Biomedical

The objective of the Biomedical theme is to work towards developing the World's smallest integrated imaging system for guided surgery. In the future, surgeons will require the ability to generate high quality, diagnostic images deep within the body using micro-scale instrumentation such as arterial guidewires. This Theme will develop major novel innovations in micro-scale cameras and surgical platform integration technologies, multi-spectral diagnostic imaging and in-body optical powering and data transmission.

Optical Communications

The Communications theme will focus on real-time internet that will require a converged wireless/optical edge cloud with unprecedented ability to dynamically reconfigure in the wavelength and time domain in response to rapid and massive bandwidth fluctuations and latency-critical service demands. Coherent communications systems offer the potential to deliver this vision, but are currently orders of magnitude too expensive. This Theme will address the question: can we build a coherent transceiver at the tens of Euro cost point required for the network edge and, if so, how will this transform metro-scale access network design?

Monolithic and Heterogeneous Integration

The Monolithic and Heterogeneous Integration theme will develop a range of essential semiconductor material, device and integration technologies, with a key objective being to find new ways to combine photonics and electronics together on multiple substrates (silicon, ceramic, polymer etc.) with unprecedented simplicity and cost-effectiveness, using transfer printing. We refer to this colloquially as 'printed photonics on anything'.

Packaging and Hybrid Integration

The Packaging and Hybrid Integration theme will focus on the high cost of photonic packaging, which can amount to as much as 80% of total product cost in some applications, which has restricted the deployment of photonics to a relatively small number of mass and niche markets to date (albeit markets of enormous value). This Theme will develop optical and electrical wafer-scale assembly and packaging processes and low cost cooling technologies that aim to 'break this cost barrier'.

Tyndall (Electronics) Theme Information

<https://www.tyndall.ie/micro-nano-systems>

Emerging Materials & Devices (Cork)

New materials and new devices are at the core of Tyndall research. Advances in technology depend on integrating new materials often in novel ways, to improve the electronic, optical, magnetic, thermal or chemical performance of devices. Our 'CMOS++' team focus in particular on meeting the demand for faster electronic devices, on a smaller footprint, that at the same time consume less power, using 'beyond CMOS' and quantum technology.

Integrated Sensors (Cork)

Our 'Sustainable Agri, Food, Environment (SAFE)' team develop applications based on novel bio/chemical sensors and systems to provide real-time informed decision-making capacity to users in animal & plant health; soil; water, air quality. Systems Integration.

Micro-Power Platforms (Cork)

This includes our 'Energy for IoT' group who work on simulation, design, fabrication and packaging for Power-Management Integrated Circuits (PMICs), energy generation, harvesting and energy storage. This technology has the potential to replace batteries in the future.

Smart Systems (Cork)

Smart Systems are self-sufficient intelligent technical systems or subsystems with advanced functionality, enabled by underlying micro- nano- and bio-systems and other components.

Our Bioelectronics team work on the development and application of devices and systems that interface directly with bio-fluids in scenarios related to human health.

Our Human-Centric systems team work on smart, connected "things", IoT applications and autonomous devices. Next generation sustainable devices improving human:environment interactivity & wellbeing:

- Capturing & analysing humans physiological: environmental interactivities (work, home, play).
- Reporting & predicting wellbeing impacts (singular & combined) of those interactivities.

Wireless RF communications : (Cork and Dublin)

We have expanding teams working in our Cork and Dublin offices in this exciting area covering technologies like RF Passive Components, Reconfigurable Devices, Adaptive RF Circuits, Microwave/ Millimetre-wave RF Systems, RF Front-ends and RF-MEMS.

IPIC & Tyndall Locations:

Cork

Tyndall National Institute (<https://www.tyndall.ie/>)

University College Cork (UCC) (<https://www.ucc.ie/en/>)

Cork Institute of Technology (CIT) (<https://www.cit.ie/>)

Dublin

Dublin City University (DCU) (<https://www.dcu.ie/>)

Trinity College Dublin (TCD) (<https://www.tcd.ie/>)