

Rince HSDS: Centre for High Speed Devices and Systems

The High Speed Devices and Systems (HSDS) Centre is one of three research centres within the [Rince Institute](http://www.rince.ie/)¹ (a PRTL1 1 funded national centre for excellence in Information and Communications Technology).

The focus of the HSDS Centre is the development of high-speed electronic and photonic materials and devices for future ultra-fast communications systems, with complementary simulation and analysis tools also being developed. Research within the group encompasses the development and processing of nano-materials; the design and demonstration of new sub-systems and devices for future terabit/s optical time division multiplexed and wavelength division multiplexed networks; and efficient modeling and simulation of high-frequency circuits and devices. HSDS currently consists of 28 researchers based in DCU. These researchers are working on a range of projects ranging from applied commercial research to blue-skies research.

Expertise:

The core expertise provided by the High Speed Devices and Systems (HSDS) Group is its ability to accurately design and characterize novel high speed materials and devices. This involves the initial simulation and modeling of the devices from basic material properties, through to efficient time and frequency domain analysis of high frequency devices and circuits, and to complete systems simulations which demonstrate device performance in practical systems. The group also has significant expertise in the experimental characterization of materials and devices, ranging from advanced non-destructive electronic nanomaterials characterisation, through to complete optical and electrical characterisation of optoelectronic devices, and to performance testing of novel devices and sub-systems in complete broadband communication systems.

Key Projects:

Currently our main research programs are funded by 4 SFI Principal Investigator Grants, 4 SFI Research Frontiers Grants, and 5 Enterprise Ireland commercialization grants. Current & recent projects include:

- Applications of wavelength tunable laser diode in next generation optical networks
- Development of all-optical processing technologies for Terabit/s optical transmission systems
- Design of Radio-over-Fibre distribution systems for broadband access networks
- Development of advanced characterization techniques for monitoring data signals in high-speed photonic systems
- Design, realization and characterization of new III-V lasers terahertz emission
- Design, realization and characterization of low noise semiconductor optical amplifiers.
- Development of Simulation and Modeling techniques for Application in Radio frequency Technology

Selected Academic Linkages:

University of Limerick, Trinity College Dublin, University College Dublin, Tyndall Institute, University of Rennes, University of Auckland, Lakehead University Ontario, National University of Ireland Maynooth.

Selected Industrial/Other Linkages:

Intune Networks, Eblana Photonics, Alcatel-Lucent,

1. <http://www.rince.ie/>

Educational / Outreach Programme:

HSDS is currently involved in to a wide range of DCU educational & outreach programmes

2nd Level: For the past 3 summers SFI Funded Secondary Teacher Assistant Researcher's (STAR) have worked in the HSDS laboratories where they have learned new skills and knowledge which can be passed on to their students - the scientists and engineers of the future

3rd Level: EE409 Optical Communications Systems. This module concentrates on the key building blocks used in developing optical transmission systems, and also the general performance characteristics of optical networks.

Summer Internships: SFI UREKA (Undergraduate Research Experience & Knowledge Awards) and RINCE John Mallon Scholars have been incorporated into the research labs during the summers. This allows undergraduate students to get a feel for postgraduate research at an early stage during their education.

Graduate Education: A Major in Nano-Electronics and Photonics is now available as part of the taught Masters in Electronic Systems. This major will fill the requirement for graduates in the fields of nano-electronics and photonics, which are extremely important for future growth within the ICT sector. Students taking this Major will study the following core modules:

- Fundamentals of Nanoelectronics Technology
- Nano & Microelectronic Device Manufacturing
- Characterisation Technology for Nanomaterials
- Optical Communications System Design
- Micro/Nano Electronic System Design

In addition to this major, the HSDS centre is also involved in one other taught module within the Masters in Electronic Systems: Advanced RF Modelling.