Photonics

Photonic devices, used in the generation, control and manipulation of light are changing the way we live our lives. We communicate with each other through mobile phones lit up with highly efficient white light emitting diodes (LEDs) and equipped with cameras. Our information is sent over the fibre optic backbone of the internet using pulses of infrared light. The data is more and more being stored in the cloud where light is critically used to manage the enormous data flows. It is clear that photonics will be a key technology for the 21st century.
At Tyndall, we develop original photonic devices for existing and new applications, building our own lasers and photodetectors in a fabrication laboratory using our designs resulting in devices that we can test and use. We seek to integrate our devices together on a common platform as is done in electronics. Much of the research is conducted with our industrial partners.

There are exciting opportunities for photonic based PhD research in the coming decades in key application areas such as communications, displays, sensing, medical and energy. Highly functional, low-cost photonic integrated circuits are needed for widespread high-bandwidth broadband availability. LEDs can provide visible light communications over short distances. With the evolution of data centres there is a critical need for much reduced energy usage. Light-based medical treatments and diagnostic tools will permit precise medical procedures and earlier detection of illness. Light-based sensors can detect tiny amounts of gases and other materials as our environmental concerns grow which photovoltaics allows us to harness light energy.

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Related Publications

- [Color stability, wave function overlap and leakage currents in InGaN-based LED structures: the role of the substrate orientation](https://doi.org/10.1088/0268-1242/30/5/055014)
  *Semiconductor Science and Technology* volume 30 issue 5 page 055014 (2015)
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