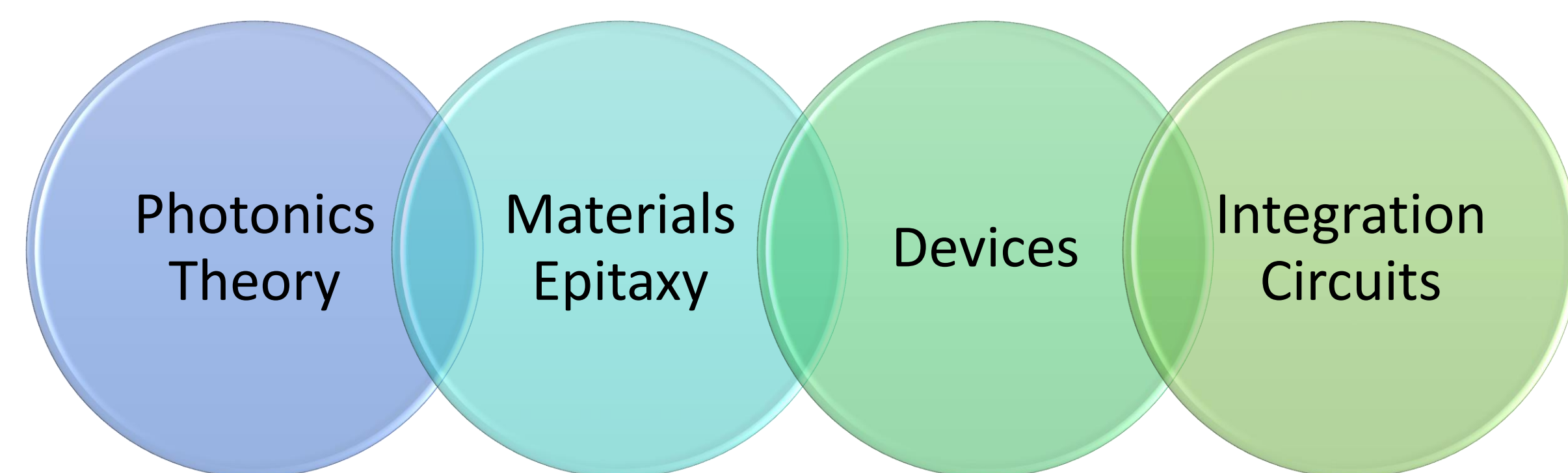


Monolithic and Heterogeneous Integration Theme

Theme director: Brian Corbett; Theme co-Ordinator: [Hui Wang](#)¹

Photonic Integrated Circuits (PICs) is becoming a technology of importance. IPIIC is developing the essential semiconductor materials, devices and integration technologies with a key objective to find new ways to combine photonics and electronics together on multiple substrates with unprecedented simplicity and cost-effectiveness, using transfer printing.

1. Research focus



2. Key technologies

• Micro-transfer printing technology

Multi-material, multi-component integration

Advantages: 10,000s of devices can be accurately transferred per cycle; makes efficient use of expensive starting materials; enormous range of integration possibilities (2D and 3D).

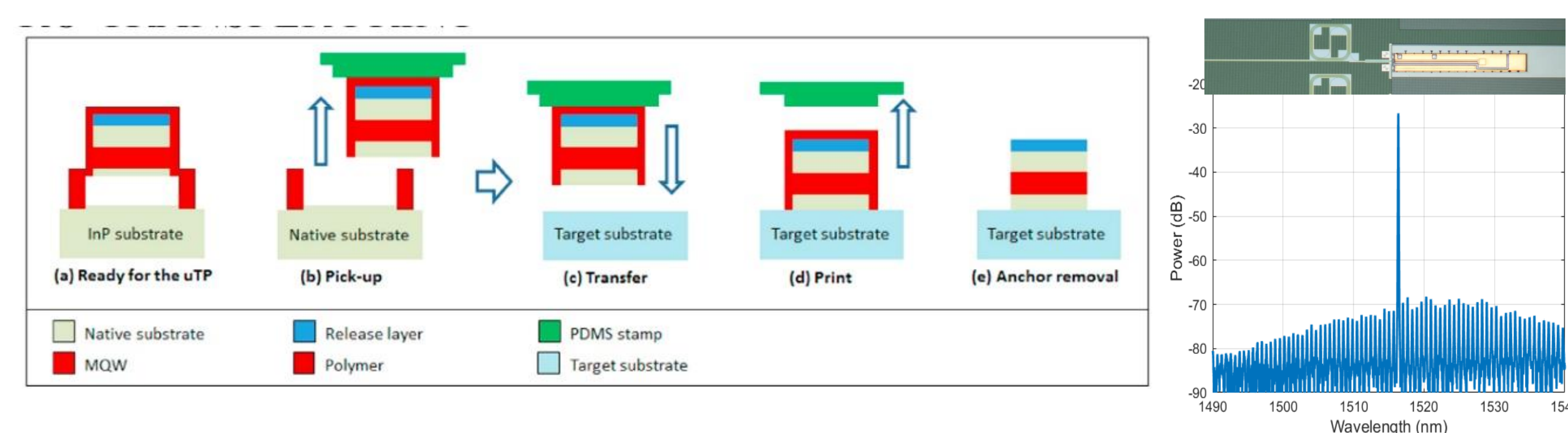


Figure 1. Micro-transfer printing process and one laser example.

• Silicon Photonics

Advantages: smaller footprint, make use of current CMOS process, low cost and high performance.

Capability: baseline expertise for pattern and etching established with electron beam lithography; faster / scaled process with new electron beam lithography system, 200mm diameter wafer processing possible.

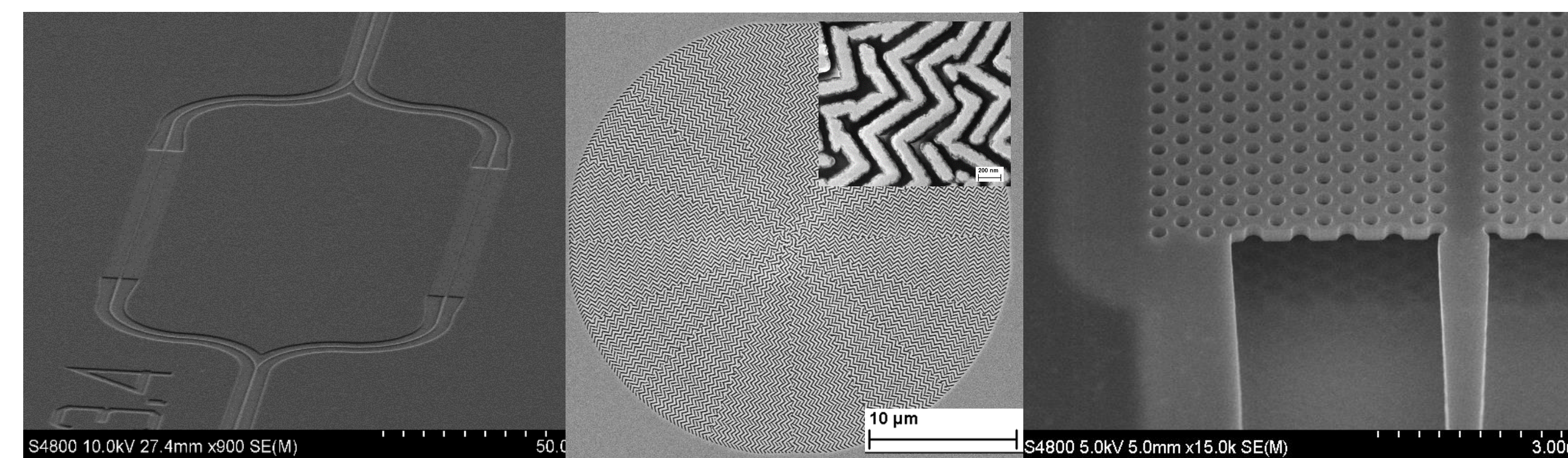


Figure 2. Silicon waveguide components made in IPIIC: slow light MZI, metal lens, air bridge silicon photonic crystal.

• Comb source

Applications: key element for telecommunications and spectroscopy .

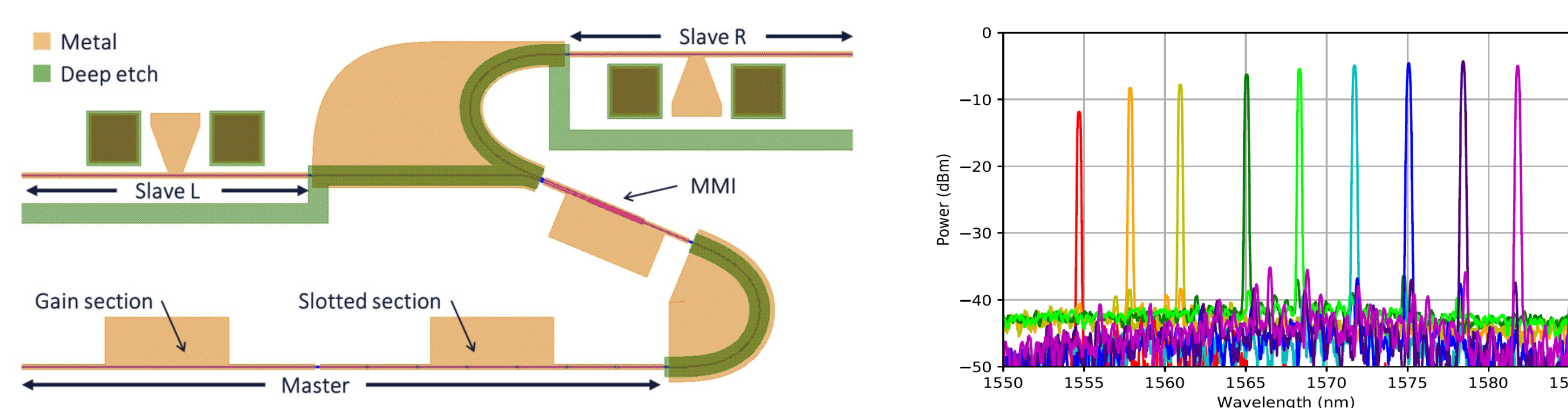


Figure 3. Design and performance of a tunable integrated dual optical frequency comb source.

• UV LED for Biophotonics

Applications in water sterilisation, medical deep clean/sterilisation, phototherapy, diagnostics

Advantages: narrowband and flexible wavelength choice.

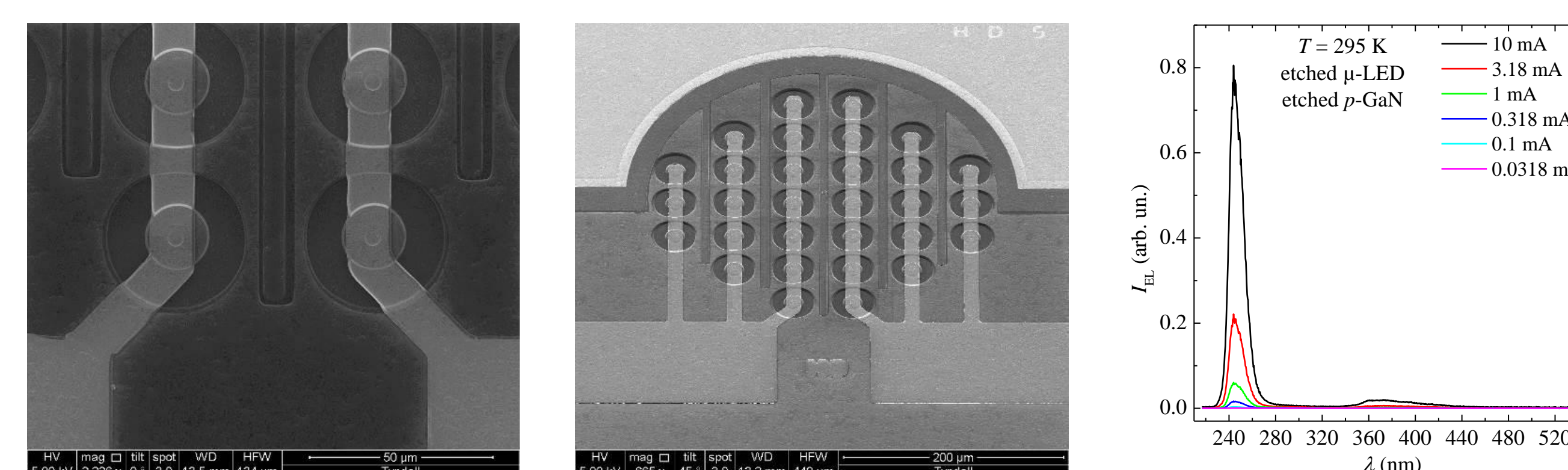
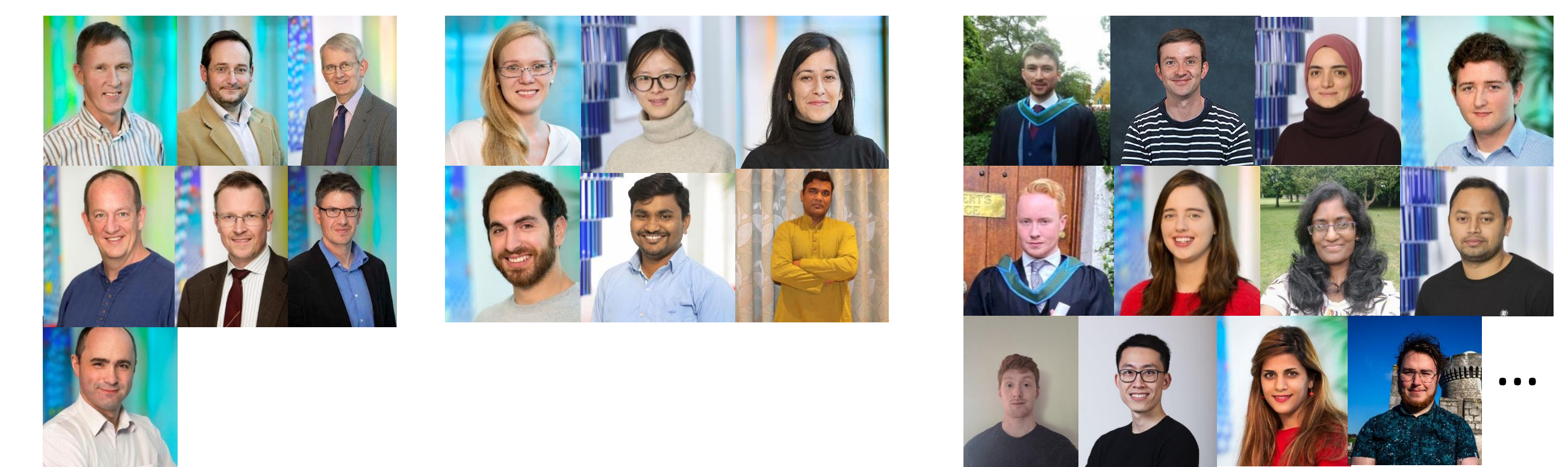


Figure 4. design and performance of an ultra Deep 243 nm LEDs.

3. People

- 7 PIs + 6 Researchers + 14 Ph.D. students



4. Collaboration

- Education and Public Engagement



• Training

Postgraduate modules; participation on doctoral training centre and Marie Curie co-fund



• Technical offer

Vertically integrated deep expertise in photonics design; epitaxy; technology; characterization; applications.

Facilities: multiscale simulations, epitaxy, fabrication, characterization.