Photonics for All 2021-4-14

Optics and Photonics technology and services in VTT

VTT

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22/01/2020 VTT – beyond the obvious

### **VTT Research on photonics systems**

### Organization on applied research About 100 researchers working on photonics!

Optical instrumentation Silicon photonics and integrated optics Embedded photonic systems in plastics Metrology and spectroscopy



# **Optical Instrumentation**





# **Novel imaging methods**

- VTT has a strong role on developing and applying novel imaging methods
- Combined with optical innovations these provide information far beyond traditional imaging
- Some examples of novel imaging methods:



High res color X-ray imaging



Hyperspectral imaging



Non-vis range imaging





360 omnidirectional imaging in vis and thermal ranges



Time of flight imaging



### Ultra-broadband and low-loss Si photonics for communication and sensing

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# Illustration of the 3 µm SOI platform



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# Main application areas for Si photonics



- Health Care
- IoT & Autonomous Systems
- Communication & computing
- Industrial sensors
- Military & Aerospace



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## **Micronova cleanroom facilities**

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- 2600 m<sup>2</sup> cleanroom area, class 10-100
- IC-clean process line (+ non-IC-clean BEOL processing and testing)
- I-line stepper lithography
- Wafer size 150 mm







#### Multi-project wafer (MPW) runs

Low-cost prototyping using VTT's process design kit (PDK) and mature process modules. VTT delivers SiPh chips with your layout.

#### **Dedicated process runs**

VTT can provide full SiPh wafers, customized wafer processes and process development to come up with an optimized solution for you.

#### **Contract manufacturing**

After successful prototyping at VTT, small and medium volume production is available via VTT in the same fab.



#### Assembly, packaging and testing

VTT can help you to convert optical chips into functional modules and systems, and to test those on wafer/chip/module/system level.

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# **Embedded photonic systems in plastics**



### Fabrication of printed and large-area photonics





· Roll-to-roll printing of wirings, active and passive components



· OLEDs, printed solar cells Microfluidics, sensors



#### Assembly and interconnection · Roll form integration of chips · Flex to flex integration



Flexible electronics · Flexible hybrid electronics



### Over-molding IML (in mold labeling) · IMD (in mold decoration)



Plastic integrated systems 3D integrated devices · Optics, mechanics and electronics integrated



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### **3D Virtual tour and handbook**



Printocent.net







https://www.printocent.net/handbook/ 266 pages of technical documentation

### How embedded photonic systems can be produced - Virtual Tours at VTT

Roll-to Roll Printing <u>https://youtu.be/gir5jxJqGk0</u> Roll-to-Roll Assembly <u>https://youtu.be/YJ3vBuZ6xIQ</u> Roll-to-Roll Converting <u>https://youtu.be/vMDoou1mLv8</u> Roll-to-Roll micro and nano-structuring for silicone elastomers <u>https://youtu.be/I5c39wb3YxQ</u> Roll-to-Roll Testing <u>https://youtu.be/6U9\_7ZEop0M</u> Roll-fed Injection moulding <u>https://youtu.be/Zf5r09v3HnA</u>

### Photonics-based medical devices



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**MedPhab** 

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# **OPTICAL SPECTROSCOPY**

Detection of spectral fingerprints to understand and control complex processes.



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### **Isotope Spectroscopy – applications examples**



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# Optical detection of CO<sub>2</sub> isotopes

- Compact device based on mid-infrared laser sources
- Shoebox size
- High precision isotopic monitoring
- Developed platform suitable for other molecules and isotopes
- Has been tested in various applications for breath analysis, biofraction monitoring and food production



# Thank you for your attention!

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