FIREFLY

SEVENTH FRAMEWORK PROGRAMME

Integrated Photonic Circuits made by Nano-Imprinting of Waveguides and Photonic Crystals

General information

- **Project short name:** FIREFLY
- **Project full title:** Multilayer Photonic Circuits made by Nano-Imprinting of Waveguides and Photonic Crystals

- **Activity:** ICT-7-3.5 - Core and disruptive photonic technologies
- **Instrument:** Small or medium-scale focused research project - STREP
- **Start Date:** 1 October 2011
- **Duration:** 3 years
- **Total budget:** € 4.959.706
- **Coordinator:** TNO (NL)

Consortium members

- TNO, NL (coordinator)
- VTT, FI
- IBM Research GMBH, CH
- Momentive Performance Materials GmbH, DE
- Imec, BE
- Universiteit Utrecht, NL
- VERTILAS GmbH, DE
- Tyndall (University College Cork), IE
- Tyco Electronics Nederland BV, NL

Motivation

- In the information and communication industry the performance of microprocessors continues to increase.
- Consequently, the data flow to and from the processors has to increase.
- ➡ Introduction of optical data transmission as a replacement of electronic data transmission in most transmission applications longer than 10 meters.
- **A need remains for optical data transmission for shorter distances**


Source: IBM

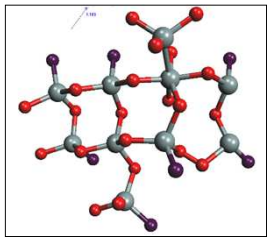

Source: IBM

Main Objective

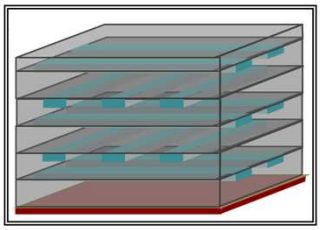
- Development of polymeric, single mode waveguides and photonic crystal structures for optical data transfer
  - based on 3D structured nano-materials
  - manufactured using new cost effective production processes
  - suitable for large scale manufacturing.
- Development of new optical components
  - VCELS
  - Waveguide-fibre coupling
- The target application:
  - the manipulation of light in, for example, optical interconnects
  - for data communication in, for example, computing systems

Expected innovations

1. New material for polymer waveguides:
   - low optical loss (high transparency at 1500 nm)
   - accurately tuneable refractive index
   - nano-imprintable



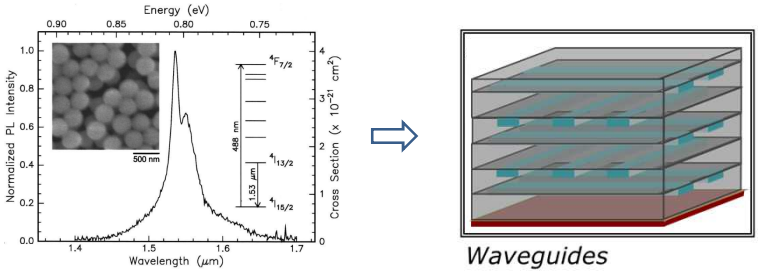
New polymer siloxanes



Waveguides

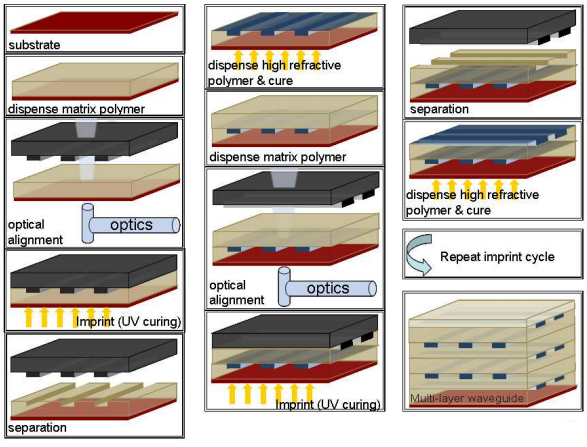
Expected innovations

2. Erbium-containing nanoparticles for active polymer waveguides



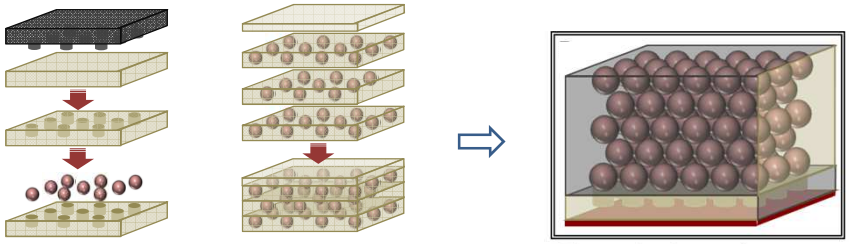
Expected innovations

3. Nano-imprint lithography as production technology



Expected innovations

4. Nano-photonic structures based on monodisperse nano-particles with a high refractive index



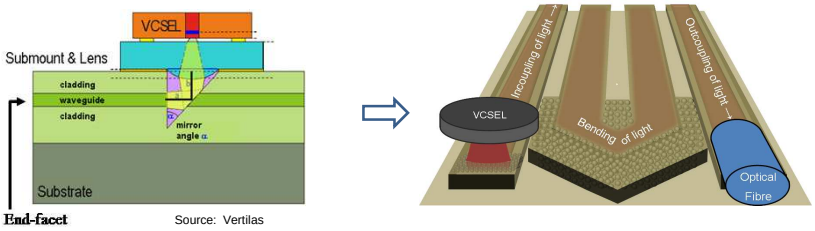
Monolayer:
New particle deposition technique

Multi-layer:
Very accurate alignment

Photonic Crystals

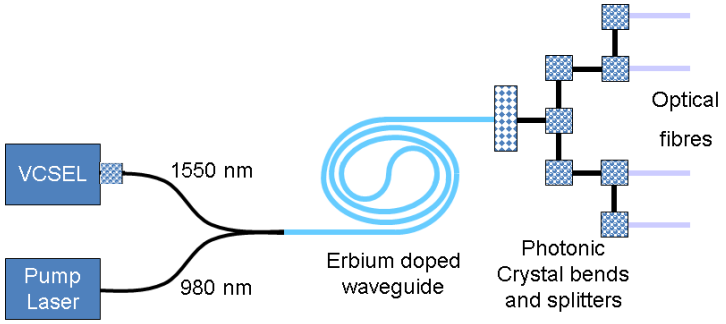
Expected innovations

6. New integration technologies
   - VCSELs
   - Fibre – waveguide coupling

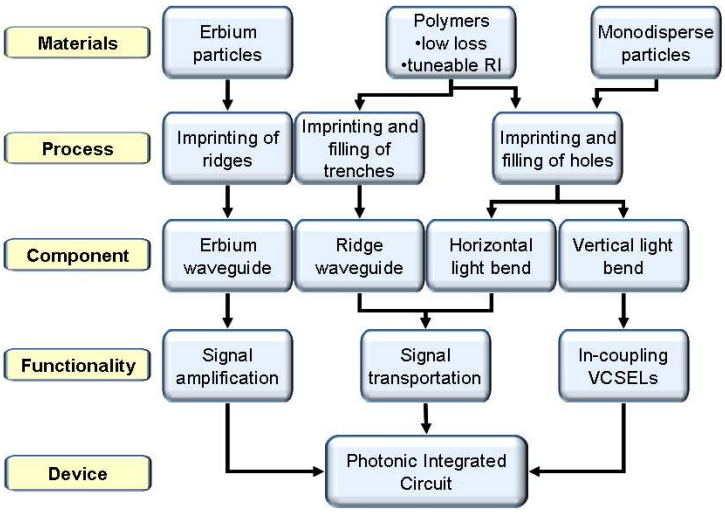


Demonstration

Integration of all innovations

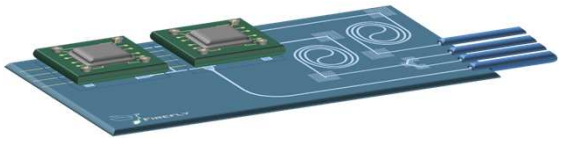


Parts of the project



Combined experience

- Modelling / simulations: Tyndall
- Material technology: Momentive, UUtrecht, TNO
- Processing: VTT, TNO
- Device expertise: VERTILAS, TE
- Integration: Imec
- End application: IBM



Contact

- For more information about the project, please contact:

- Sjoukje Wiegersma
- sjoukje.wiegersma@tno.nl

- Arjen Boersma
- arjen.boersma@tno.nl

- TNO
- De Rondom 1
- 5612AP Eindhoven
- The Netherlands

- www.fp7-firefly.eu

FIREFLY