

TNO Innovation for life

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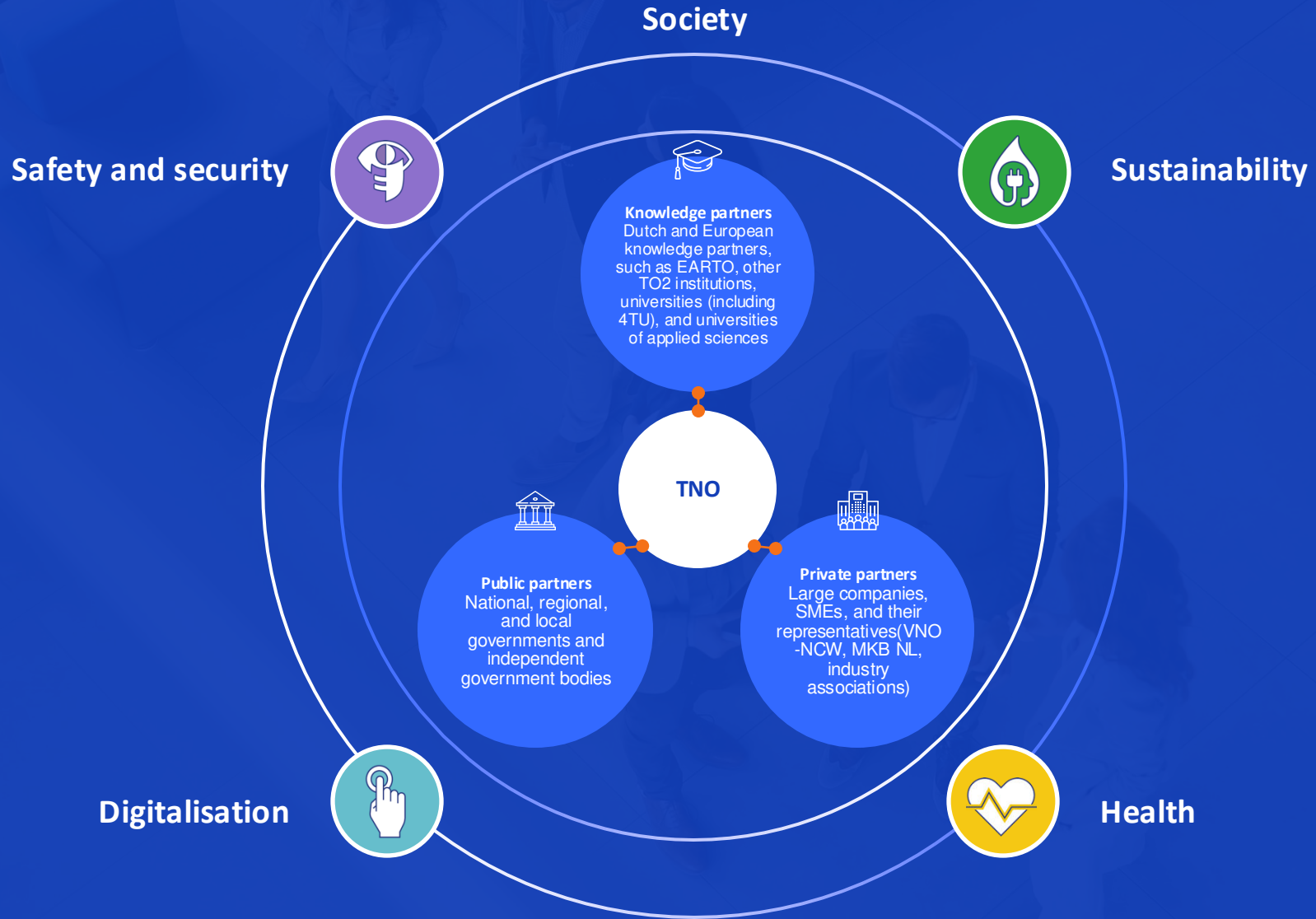




TNO Mission

TNO's mission is to create impactful innovations for the sustainable wellbeing and prosperity of society.





About TNO

687,8

Organisation revenue

1.067

Public-private partnerships (2023)

4.187

Employees (2023)

937

Patents (2023)





Units

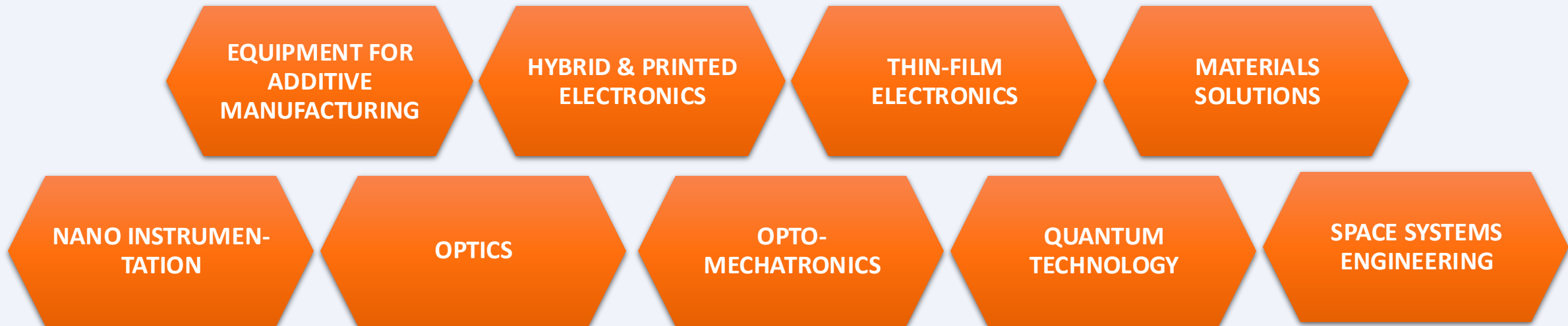


Overview of the Unit High Tech Industry

4 Market Proposition



9 RESEARCH GROUPS

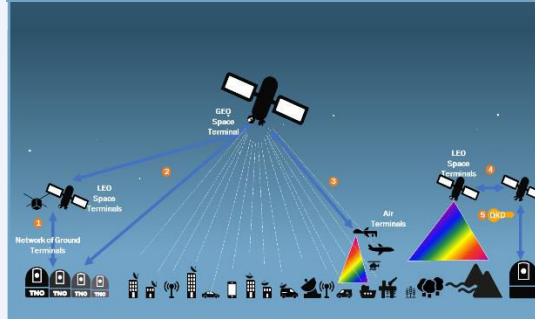


Space and Scientific Instrumentation: our Portfolio

Instruments for Earth Observation



Satellite Communication: Laser & RF



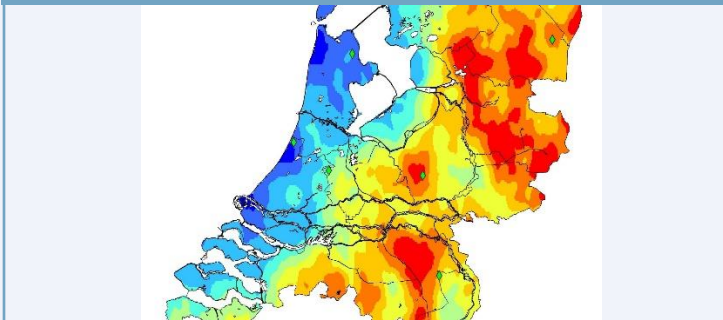
Instruments for Ground based Astronomy



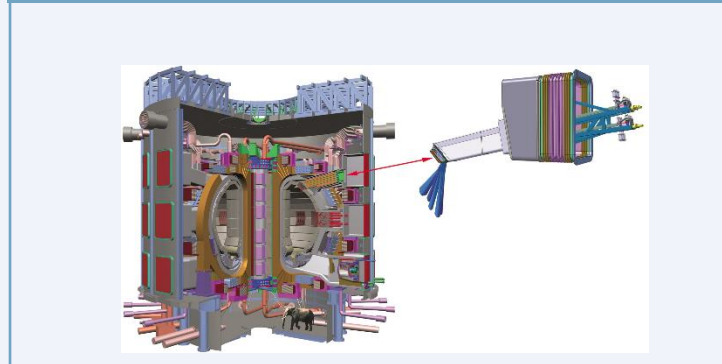
Instruments for Space based Astronomy



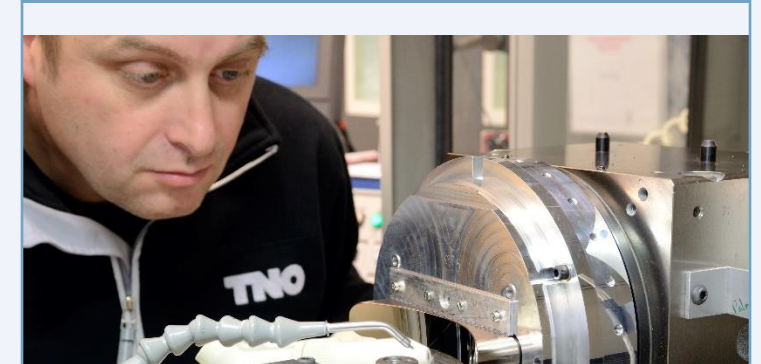
Space Data Utilization: Air Quality & GHG Modelling



Scientific Instrumentation




High End Optics Manufacturing



Semicon & Quantum: Our Portfolio

Equipment to enable a data driven society



Systems Lifetime ← for the Semiconductor Industry → **Metrology**

Stimulating Economic Growth ...
... and a secure digital society



Quantum Technologies

Contributing to a Healthy Society

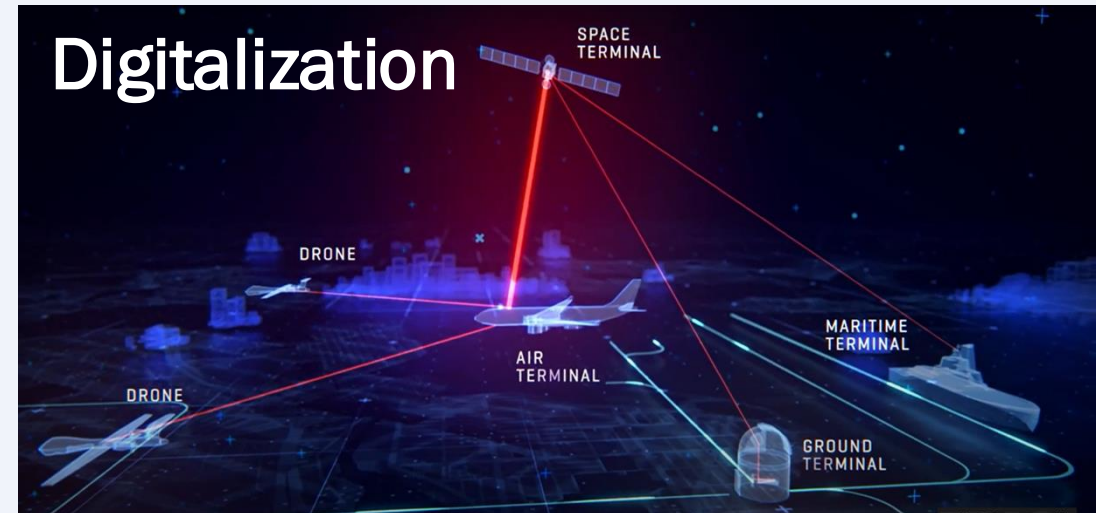
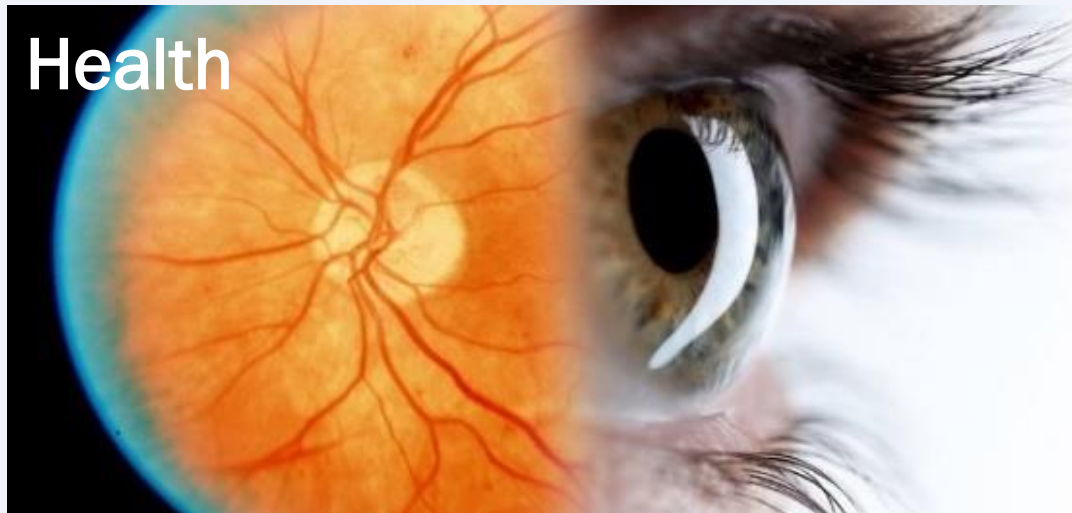
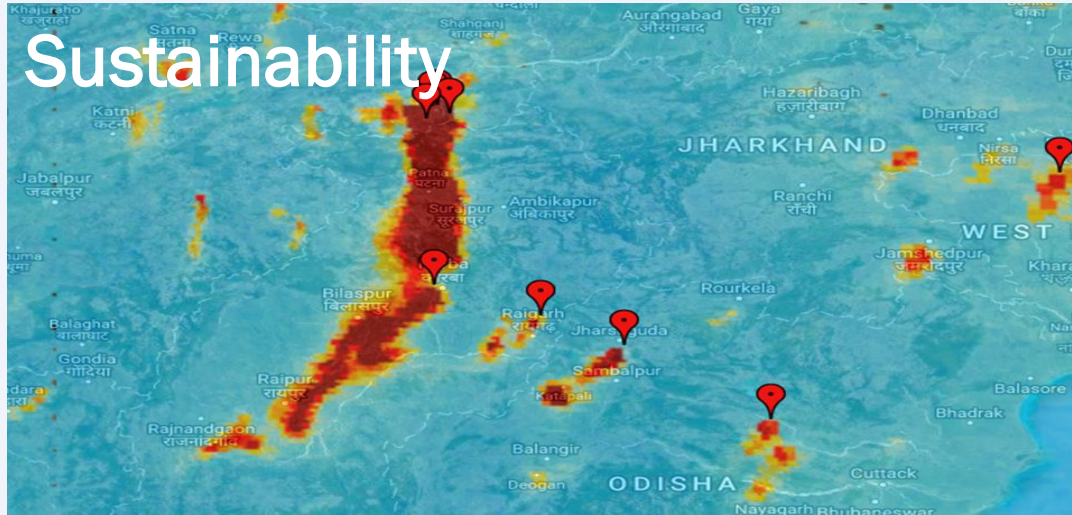


Medical Photonics

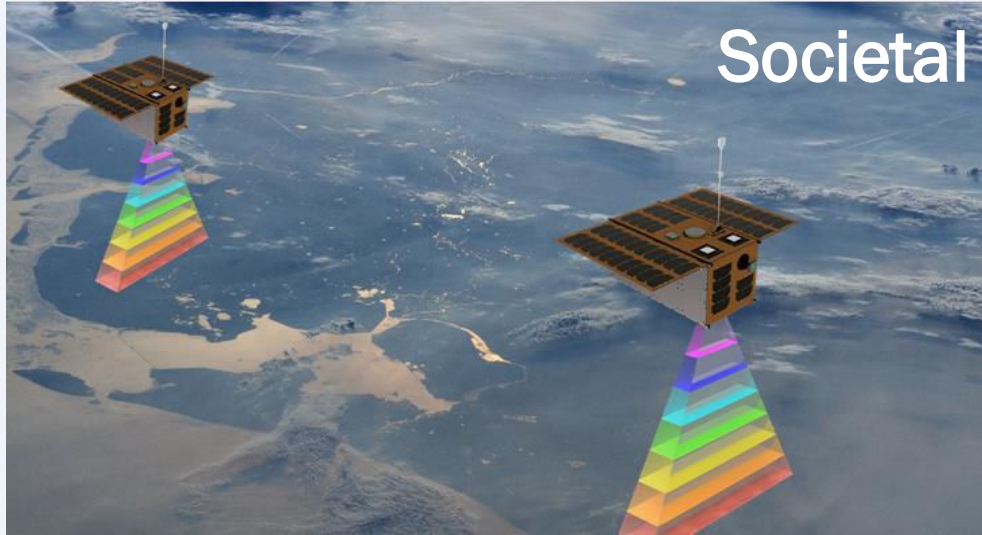


80 years of TNO Optics

TNO: breakthrough optical solutions for



Optics with impact, together with our partners

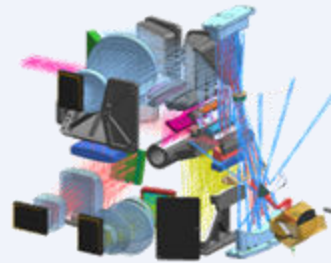


Wide range of optical technologies

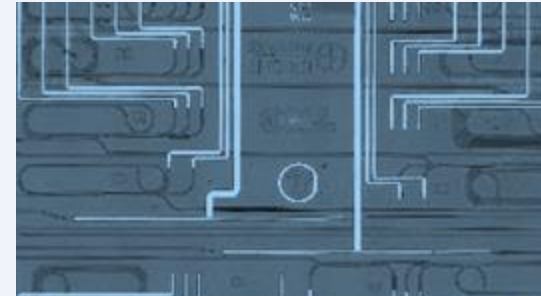
Technologies



Free-space optical systems
Fiber-based optical systems
Integrated & nano-photonics
Calibration of space instruments



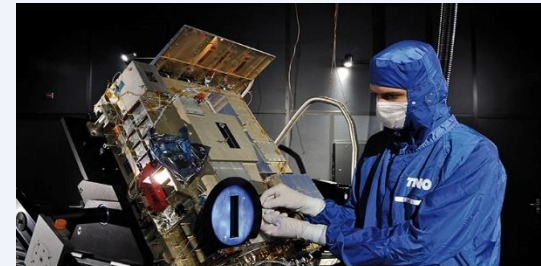
Free-space optical systems



Integrated & nano-photonics



Fiber-based optical systems



Calibration of space inst.

Working towards the future: market trends

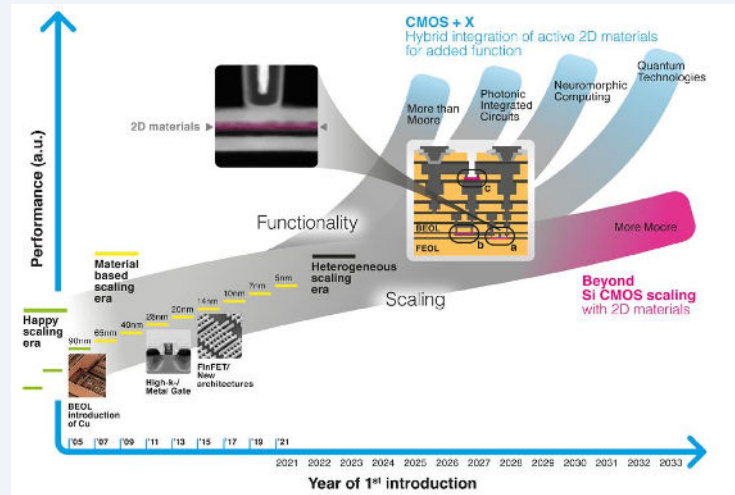
Space

Reducing power and weight, enabling manufacturing, multi-device systems



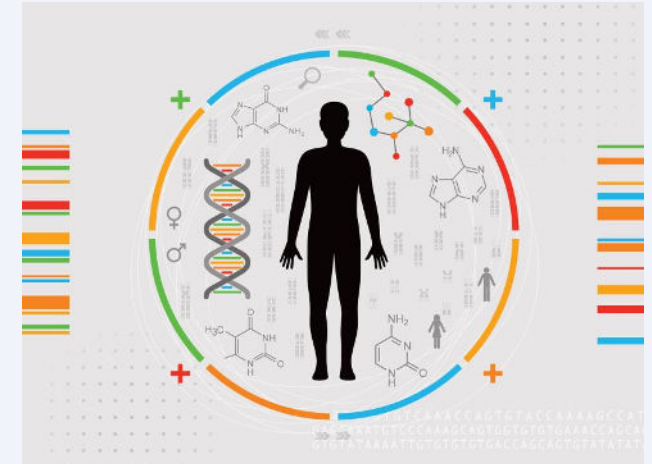
Semiconductor

Harnessing new scientific discoveries for new next generation products.



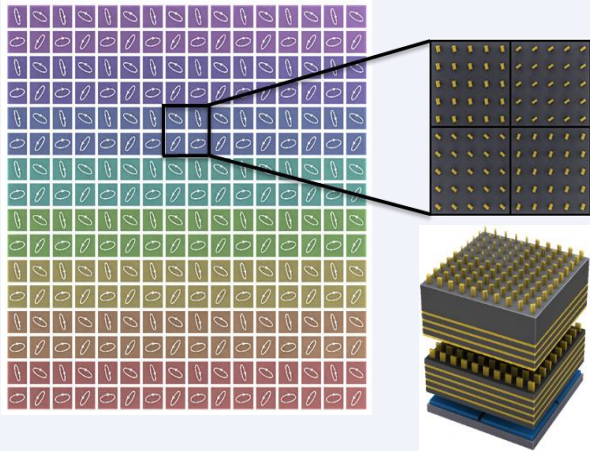
Medical

Personalized medicine
Point of care diagnostics

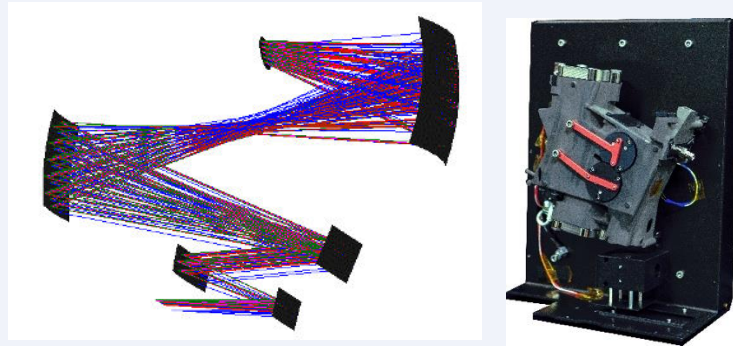


Example trends in optics: miniaturization

Meta materials



Small satellites

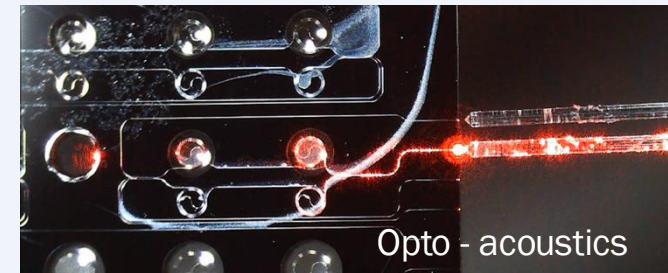


All freeform design

Photonic integrated circuits



Delta Life Science



Opto - acoustics

Reducing power and weight, enabling manufacturing, multi-device systems

Photonic Integration Technology Center

- PITC is a joint innovation center, set up to accelerate the industrial adoption of integrated photonics
- The PITC initiative brings together the photonic fundamentals (TU/e, UT) and industry driven research (TNO)
- In our shared research programs, we tackle key technology challenges together with our industrial partners



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A collaboration of



PITC activities in National Growth Funds

Already running

- Metrology program
- InP program
- Heterogeneous integration program

To start SiN activities with TRL 3-6/7

- joint UT and TNO team in Twente, growing to 15-20 fte by 2028
- Strongly supported by (local) stakeholders.

UT EN TNO ZOEKEN NAUWERE SAMENWERKING



De Universiteit Twente en onderzoeksinstituut TNO hebben reeds een lange geschiedenis in het samenwerken aan maatschappelijke vraagstukken. In de komende periode gaan zij onderzoeken hoe zij, op een aantal thema's, die samenwerking nog steviger kunnen verankeren. Dat moet leiden tot een aantal concrete thema's waarop zij structureel samen gaan werken op de campus van de universiteit.

Al langer spreken UT en TNO over intensifiëren van de samenwerking. Zo werd in 2021 een intentieovereenkomst getekend om nieuwe initiatieven te ontplooiën in robotics, cyber security en intelligent diagnostics. Dat leidde onder andere tot de deelname van TNO in het Twente University Centre for Cybersecurity Research (TUCCR).

Voortbordurend op die goede ervaringen, gaan de beide organisaties in de komende maanden verder onderzoeken hoe zij elkaar kunnen versterken op een viertal thema's:

- Integrated Photonics
- Bio/Microsystems
- Intelligent Diagnostics and Predictive Maintenance
- Digital Asset Lifecycle Management for Construction

PITC research activities

Examples

- Low loss SiN wave guides for quantum and microwave photonics applications. Target: <0.01 dB/cm
- Integration of ultra-low loss modulators on SiN
 - PZT (stress based) modulators for quasi-DC application, $<1\mu\text{W}$ per modulator
 - Direct e-o modulation through heterogeneous integration, with V_{pi} (@1 mm) <5 Volt and switching speed >100 GHz
- Low-loss optical coupling
 - Chip-to-fiber and chip-to-chip. Target: <0.5 -1 dB.



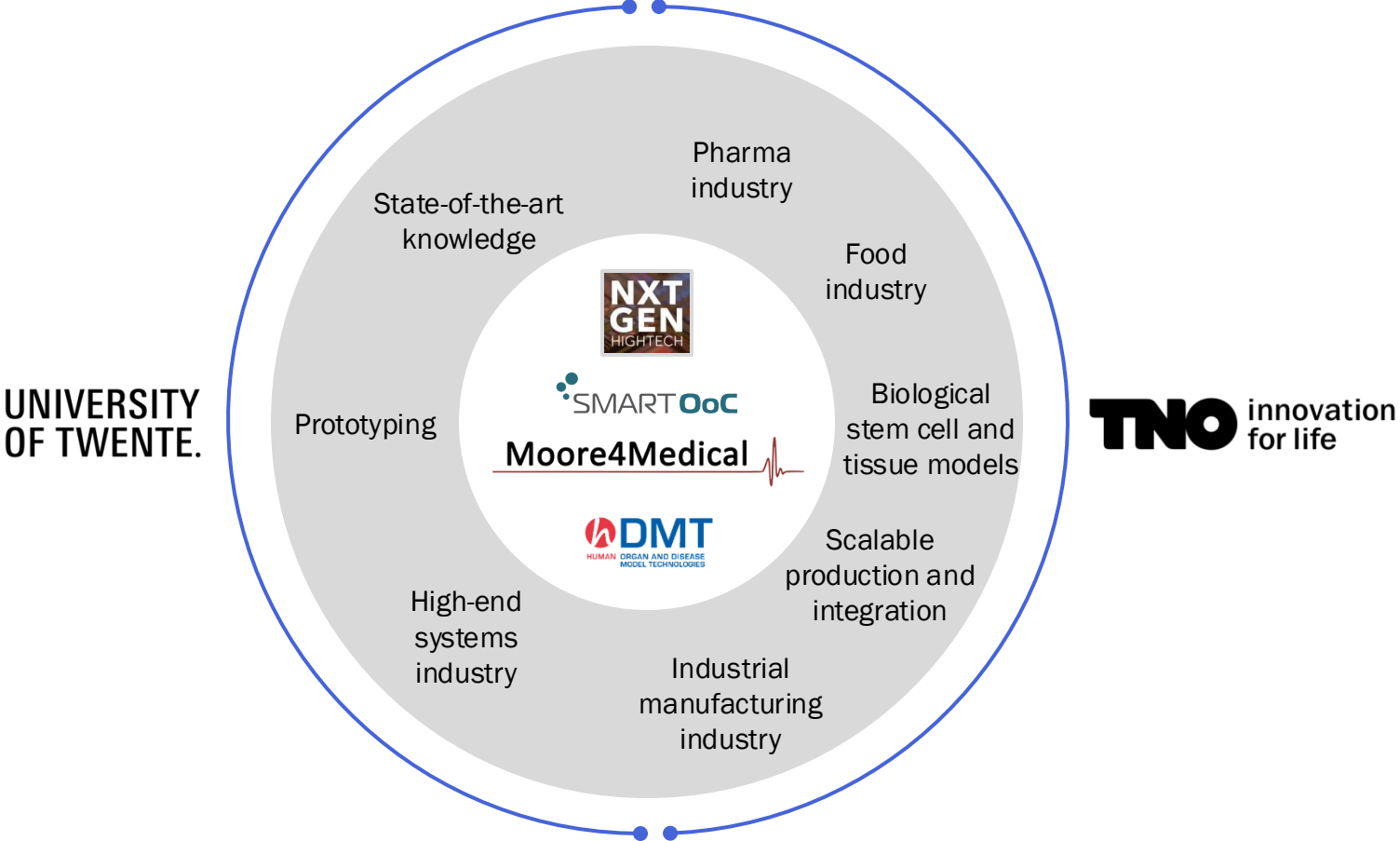


B MSC

Powered by TNO and University of Twente

**INTRODUCTION BIO/MICROSYSTEMS CENTRE:
SCALABLE SOLUTIONS FOR BIOMEDICAL APPLICATIONS**

TNO AND UT ARE IDEALLY POSITIONED TO ACCELERATE STANDARDIZED TECHNOLOGY TO THE MARKET

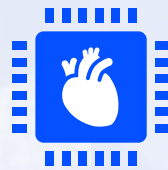


Organ on a chip program



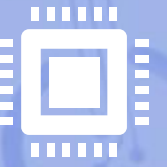
Tissue Engineering

To grow living cells into organotypic structures that contain all the essential elements to replicate one or more tissue specific functions.



Organ-on-Chip

A small functional unit that mimics functionalities of human organs in vitro.



Microtechnology

To create a microfluidic cell culture device in which the in vivo environment can be replicated from biochemical and physical point of view.

Thank you for
your attention

Careers | TNO
recruitment@tno.nl

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