Photonics as a Versatile Tool
- not only in Industrial Production

INDTECH 2018

Dr. Thomas Rettich, TRUMPF GmbH + Co. KG
Photonics21 Executive Board member, Chair WG 2
29th October 2018
Workshop “Photonics4Industrial Production”

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Agenda

- **Photonics21 – Overview**
- **Towards the next European Framework Programme: “HORIZON EUROPE”**
- **Photonics Vision & Missions: Europe’s Age of Light**
- **Strategic Roadmap for “Industrial Manufacturing and Quality”**

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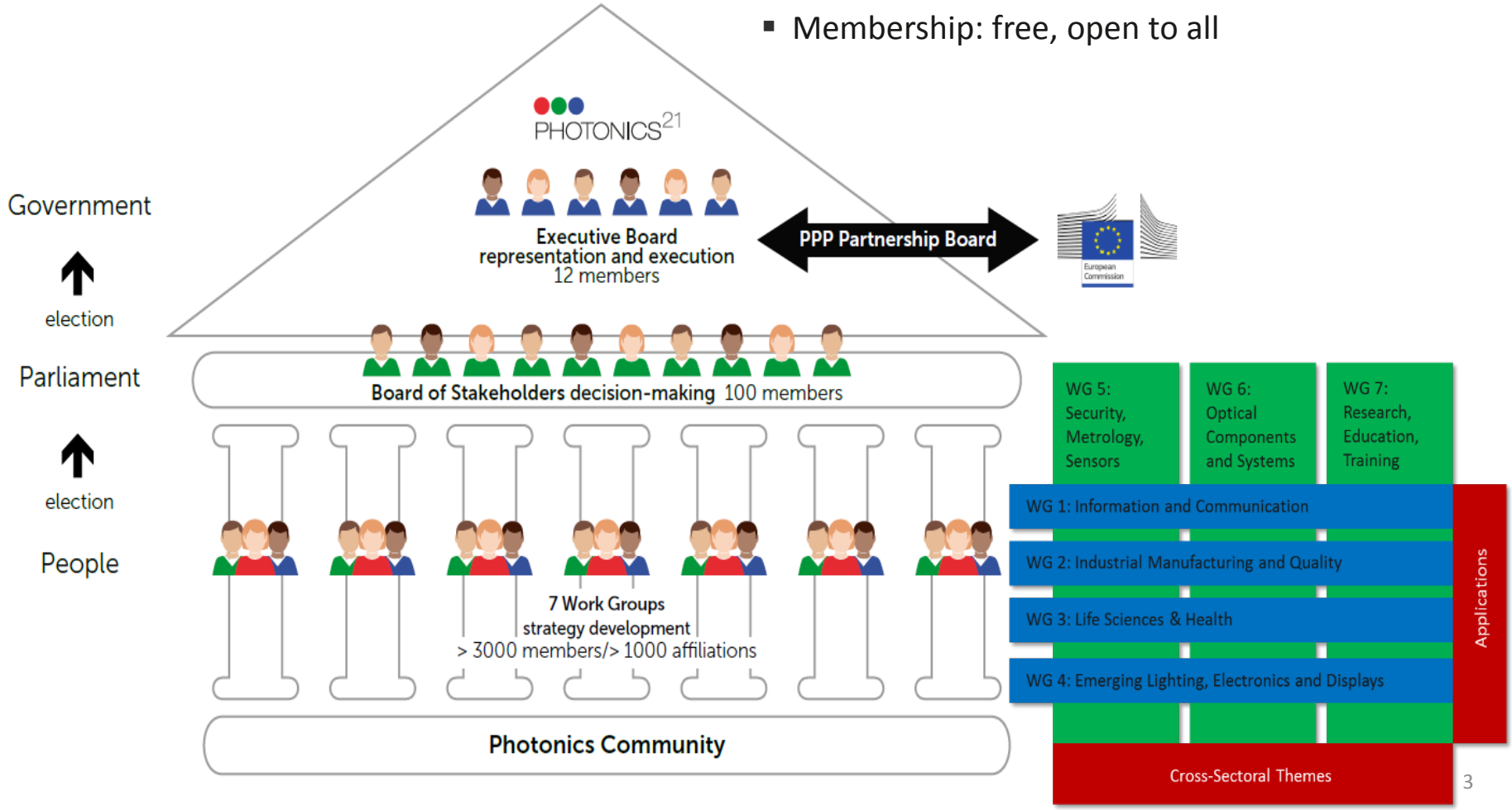
Photonics PPP - Open and transparent Governance Structures

A broad Photonics21 community drives the Photonics PPP Decision Making

- Photonics21: More than **3000 members** (representing **>1000 affiliations**) from all over Europe
- Membership: free, open to all



Photonics21 Executive Board

President: N.N.

Vice Presidents:
Giorgio Anania, President & CEO Aledia
Jaap Lombaers, Managing Director Holst Centre
Hugo Thienpont, Director of Research Brussels Photonics Team, Professor VUB
Bernd Schulte, Executive Board Member, President Aixtron

Work Group Chairs:

Information & Communication	Industrial Production/ Manufacturing & Quality	Life Science & Health	Emerging Lighting, Electronics & Displays
Jean-Luc Beylat, President Alcatel Lucent Bell Labs France	Thomas Rettich, Head of Research Coordination TRUMPF	Jürgen Popp, Director Leibniz-Institut für Photonische Technologien e.V.	Heinz Seyringer, CEO V-Research GmbH

Security, Metrology & Sensors	Design & Manufacturing of Components & Systems	Photonics Research , Education & Training
Peter Seitz, CSO Kenzen AG, Managing Director Hamamatsu Photonics – Applied Research Europe	Mike Wale, Director Active Products Research Oclaro	Roberta Ramponi, Consiglio Nazionale delle Ricerche

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Photonics21 – Our Way forward for Growth & Jobs in Europe

Photonics has achieved a lot over the last years and we are strategically preparing to take up future opportunities and meet upcoming challenges

Foundation

Photonics21 in 2006

- Founded as a European Technology Platform
- Advisor to the European Commission
- 60 starting members

Developing in FP7

Photonics as a KET

- Photonics Technologies nominated as a KET
- Increased Budget in ICT calls
- > 2000 members

Horizon 2020

Photonics cPPP

- Joint PPP of European Commission and Photonics21
- Cross cutting activities
- >3.000 members

Horizon Europe

#next_photonics.

- Strategy Roadmap Process ongoing
- Vision Paper published

Source: Photonics21/VDI Technologiezentrum GmbH, Photographer: VDI-TZ

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Towards Horizon Europe:
Photonics PPP Actions and Input Papers for Assessments

2016 >>>>> 2017 >>>>>>>> 2018 >>>>> >> 2019 >> 2020 > 2021

Horizon 2020 Mid-Term Review and KPI Monitoring

Studies and Surveys & PPP Mid-Term Review assessing success and structure of the Photonics PPP as basis for strategy towards FP 9

Strategy Process towards a Photonics Vision Paper

Board of Stakeholder Task Force Strategy & conducted expert meetings incl. end-users resulting in the Photonics21 Vision Paper based on a mega market approach

Photonics Multiannual Road Map

Based on the learnings from Horizon 2020 as well as the Vision Paper - starting Multiannual Roadmap Process for Horizon Europe

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Europe’s age of light – Our Vision & Missions for the next Decade

Implement a photonics agenda for Europe

- Create and implement a European strategy for photonics leadership
- Build a truly European lab-to fab infrastructure
- Open up current subsidy regimes
- Boost opportunities for entrepreneurship
- Accelerate the build-out of 5G and terrestrial broadband
- Strengthen control over data and privacy standards
- Educate and train tomorrow’s specialists
- Coordinate cyber-security efforts
- Turn the public sector into a lead innovator
- Establish a strong digital innovation ecosystem

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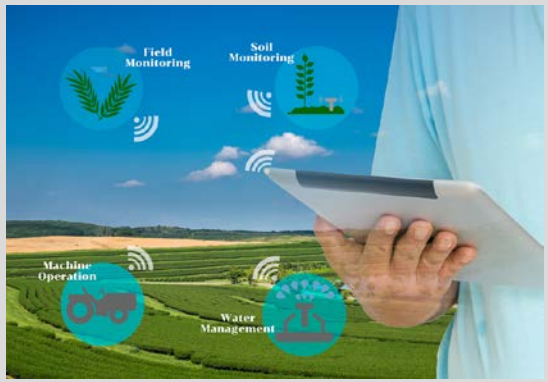
Europe's age of light – Our Vision & Missions for the next Decade

New brochure outlines how photonics will power growth and innovation

Instant diagnosis of major diseases



Quality food from farm to fork

Accident and congestions-free road transport

A truly circular economy

Photonics as a flagship science for innovation

A new quality of urban life

Empowering Industrie 4.0 for a million new jobs

Zero downtime in a terabit economy

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Live Longer – Feel better

Photonics in life science and healthcare

Our mission: instant diagnosis of major diseases

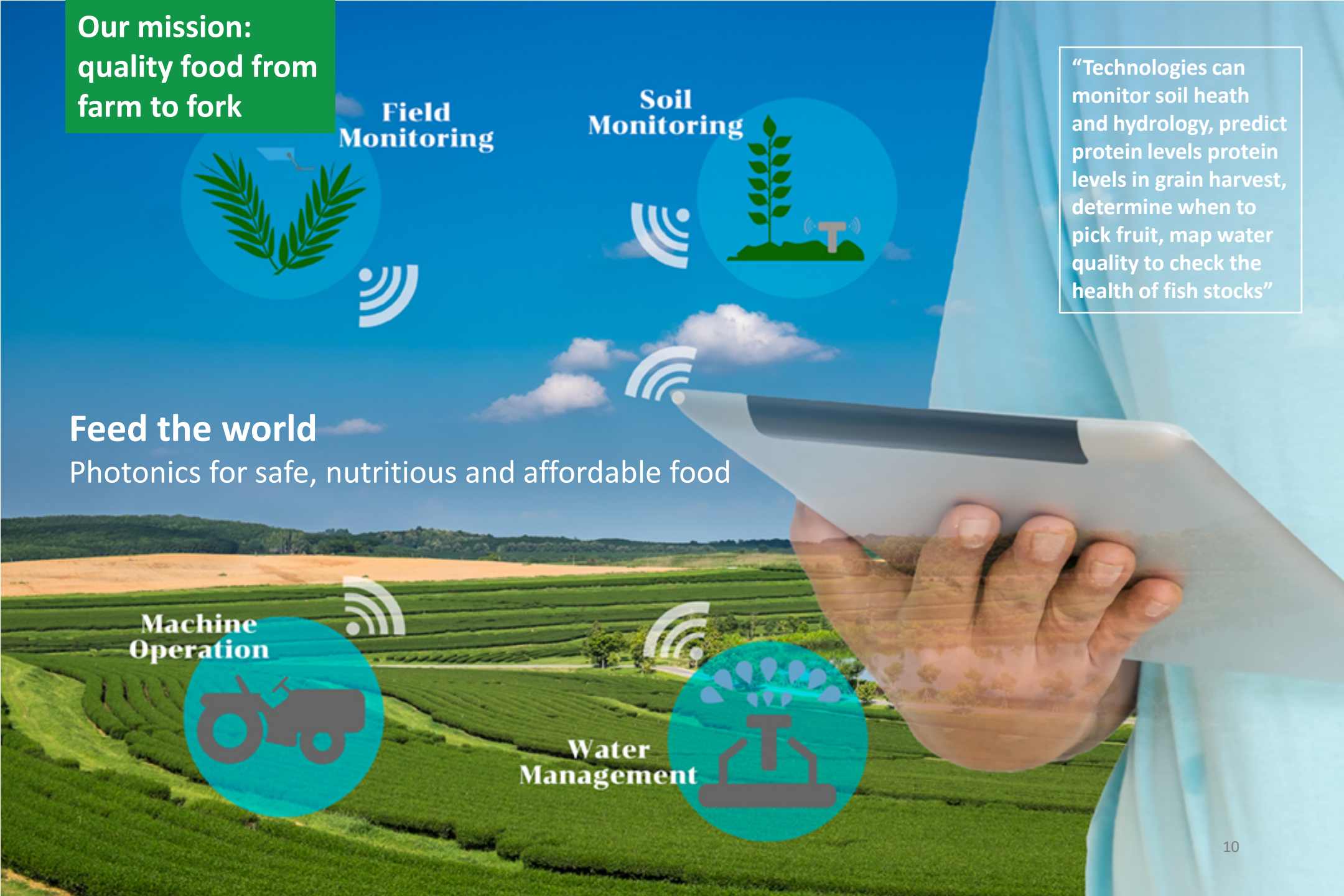
Point of care optical diagnostics allows medical diagnostics on the spot

80% of medical diagnostics is based on photonics

Highly targeted treatment and non-invasive by nature

Already, photonics plays a crucial role in the diagnosis or treatment of virtually every major disease”

Our mission: quality food from farm to fork

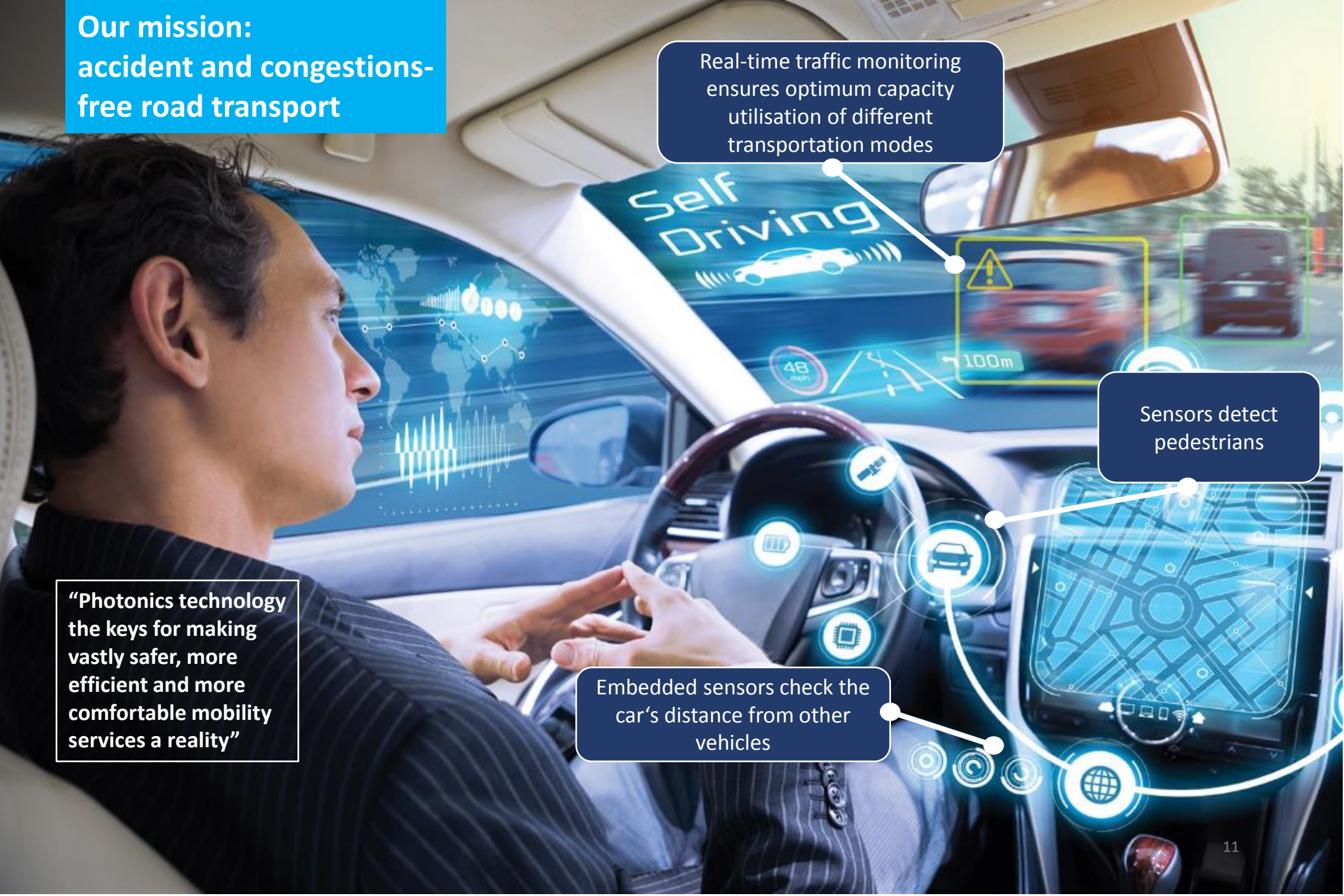


Feed the world

Photonics for safe, nutritious and affordable food

"Technologies can monitor soil heath and hydrology, predict protein levels protein levels in grain harvest, determine when to pick fruit, map water quality to check the health of fish stocks"

Our mission: accident and congestions-free road transport



Real-time traffic monitoring ensures optimum capacity utilisation of different transportation modes

Sensors detect pedestrians

Embedded sensors check the car‘s distance from other vehicles

“Photonics technology the keys for making vastly safer, more efficient and more comfortable mobility services a reality”

Our mission: a million new jobs

Empowering Industry 4.0

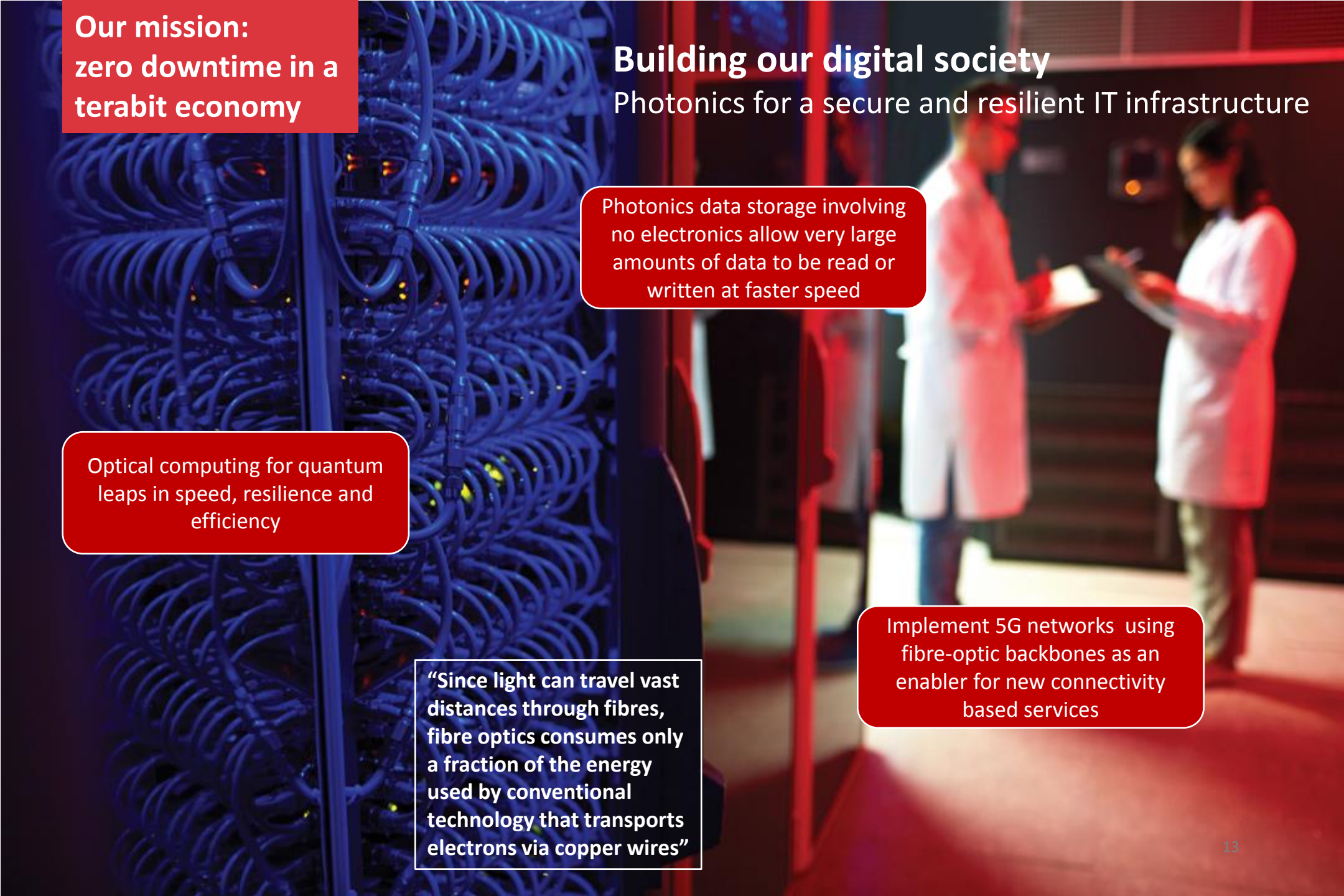
Photonics for manufacturing and production

Advanced optical sensors, 3D machine visions and 3D imaging enable high-precision and interruption free production

Laser-based additive manufacturing pave the w on-demand manufactur

EUV lithography systems allow generating nano-sized structures for smaller and faster microprocessors

"Manufacturing is already undergoing a photonics revolution, with earlier generations of factory machinery increasingly giving way to lasers and sensors, usually in conjunction with robots"



Our mission: zero downtime in a terabit economy

Building our digital society

Photonics for a secure and resilient IT infrastructure

Photonics data storage involving no electronics allow very large amounts of data to be read or written at faster speed

Optical computing for quantum leaps in speed, resilience and efficiency

"Since light can travel vast distances through fibres, fibre optics consumes only a fraction of the energy used by conventional technology that transports electrons via copper wires"

Implement 5G networks using fibre-optic backbones as an enabler for new connectivity based services

Our mission: a truly circular economy

Laser-based disassembly will be able to separate complex products into components for the future

Green Photonics technologies generate or conserve energy, produce light or reduce emissions or pollutions

“The use of intelligently networked pollution detectors will give us unprecedented control over air and water quality”

20 % of all electricity used is for lighting – transition to low-energy LED and OLEDs contributes to energy saving

Our mission: 10 % higher productivity

Access control, intrusion detection and pattern recognition systems featuring biometric techniques improve surveillance

“Smart homes and offices will be development hotspots for the Internet of Things (IoT), requiring sensors, cameras, displays and many kind of optical IT”

Photonics enabled digital connectivity creates a new quality of urban life

Interior and exterior lighting can be used for data transmission such as Wi-Fi that uses LED

Human centric lighting (HLC) research strives for biological optimal lighting

Our mission: photonics as a flagship science for innovation

Innovation in photonics is strongly interdisciplinary - cutting across boudaries of physiscs and chemistry, engineering, material science, IT, medicine, art, design and more

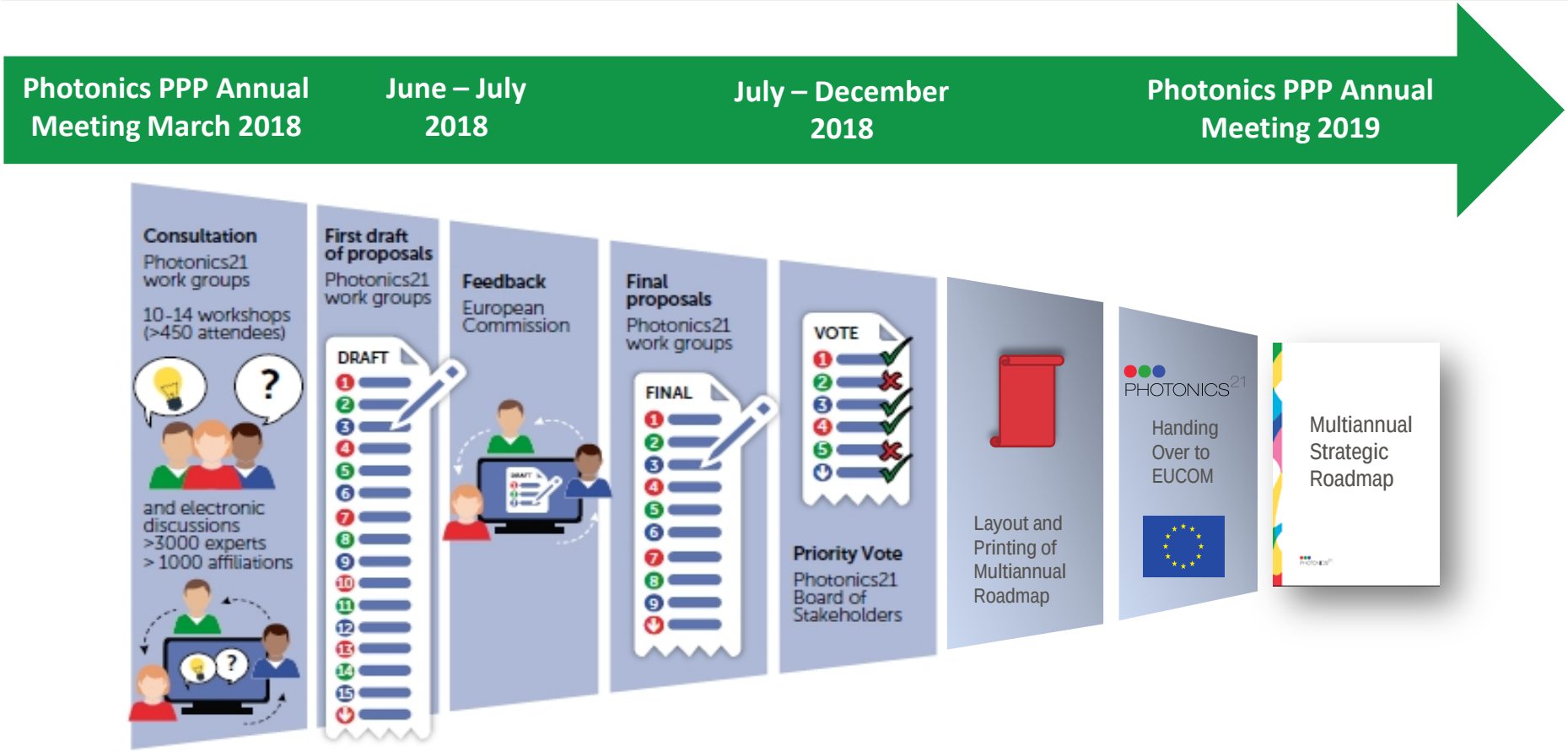
"In the future every child in Europe should know about the many ways that light can be harnessed for innovation"

Photonics playing an instrumental role of changing the way to educate and way we transfer skills"

"3D visualization and augmented reality will make learning and the exchange of ideas easy, effective and fun"

Photonics21 Multi-annual Strategic Roadmap Process: Towards "Horizon Europe"

Open – Democratic – Inclusive



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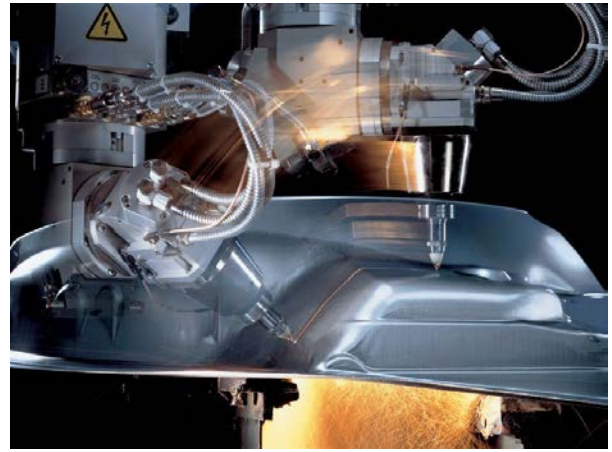
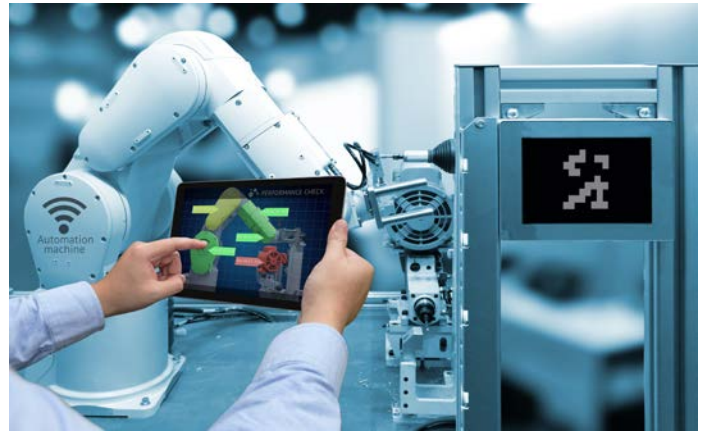
Strategic Roadmap
Work Group 2: Industrial Manufacturing & Quality

Empowering Industry 4.0 with Tailored Light



FAST
- High speed materials processing
- Connected production

GREEN
- CO_2 emission reduction
- Weight reduction
- Materials savings



FLEXIBLE
- Agile manufacturing
- Digitalisation

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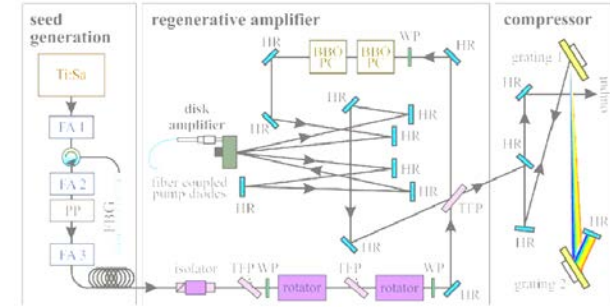
Strategic Roadmap (WG2: Industrial Manufacturing & Quality)
Major Photonics Research & Innovation Challenges

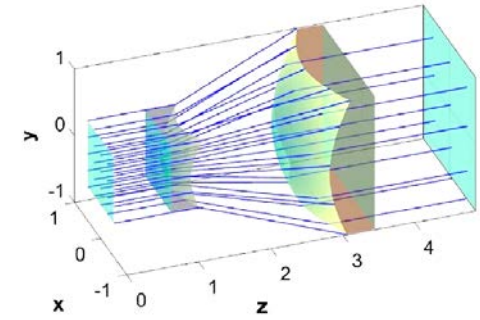
Laser beam sources and components



- High energy and highly agile ultra-short pulse lasers
- High brilliance diode lasers with different wavelengths
- Lasers for the generation of coherent X-rays
- High power mid infra-red lasers with wavelengths greater than 1 µm
- Multi beam lasers
- Material, coatings and components for high power/high intensity beams

Beam guidance and beam shaping

- Novel optical fibres for use at wavelengths greater than the UV (and beyond 2µm)
- Non-mechanical high-speed beam scanning systems
- Re-configurable and programmable beam shaping systems (tailored light)
- Rapid monitoring and quantitative feedback systems
- Focusing and imaging optics facing the Abbe limit for highest spatial resolution
- Multi beam guiding and switching
- Miniaturized interchangeable optical processing systems



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Strategic Roadmap (WG2, Industrial Manufacturing & Quality)
Major Photonics Research & Innovation Challenges

Industry 4.0

- Connectivity of laser systems for integration in manufacturing platforms
- Integration of sensors throughout the laser processing system
- Parallel processing for high throughput
- On-line non-destructive testing of laser manufactured parts
- Real time process control
- Big Data Correlation, meta modelling and quality prediction
- Data and knowledge management for laser materials processing
- “standardized” CAM-modules for materials processing
- Development and integration of simulation tools into production chains

Laser specific materials development

- Alloys and materials for additive manufacturing
- Photonic specific materials for electronics
- High performance materials for laser processes

Quality Control and NDT

Skilled people and flexible infrastructure

Thank you
for your attention!

Further information: www.photonics21.org

Contact: secretariat@photonics21.org

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