ACTPHAST4R: Open Access to European Photonics Prototyping Platforms for Innovation-driven Researchers
Outline of this presentation

• Why Europe needs this innovation initiative?

• What it could offer you

• How it works and who can apply

• The impact we are aiming for
“PHOTONICS” is the science and technology that innovates with the unique properties of light
PHOTONICS
a key digital technology
Photonics
a win-win-win-win-win scenario

Energy friendly

Innovation driver

Societal impact

Economic motor
The impact of photonics on the global and EU economy is huge

- Global photonics market € 458 Bn in 2015
- EU total share 15% or € 69 Bn
- EU Photonics Production CAGR of 5% (> 3,5x EU GDP growth)
- Strong export position > 68%
- Innovative high tech industry: 9–10% R&D
- Leverages at least 10% of the EU economy
- More than 5000 SMEs in EU
- More than 350000 direct employees in EU

Source: Optech Consulting Market Research Study 24.1.2017
Photonics: 1 of 8 key technologies that are presently enabling the processes of discovery and innovation

Photonics
Advanced Manufacturing
Biotechnology
Advanced Materials
Nanotechnology
Nanoelectronics
Artificial Intelligence
Cyber Security
Building our digital society
Photonics for a secure and resilient IT infrastructure

Our mission:
zero downtime in a terabit economy

"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."

A new quality of urban life
Photonics for smart homes and liveable cities

Our mission:
10% higher productivity

"Smart homes and offices will be development hotspots for the Internet of Things (IoT), requiring sensors, cameras, displays and many kinds of optical IT."
Empowering Industry 4.0
Photonics in manufacturing and production

Our mission:
a million new jobs

“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.”

Keep our traffic flowing
Photonics for connected mobility

Our mission:
accident and congestion-free road transport

“Photonics technology holds many of the keys for making vastly safer, more efficient and more comfortable mobility services a reality.”
Live longer, feel better
Photonics in life sciences and healthcare

Our mission:
immediate diagnosis of major diseases

Feed the world
Photonics for safe, nutritious and affordable food

Our mission:
quality food from farm to fork

Field Monitoring
Soil Monitoring
Machine Operation
Water Management

“Already, photonics plays a crucial role in the diagnosis or treatment of virtually every major disease.”
Zero emission, less waste
Photonics for sustainability and a clean environment

Our mission:
a truly circular economy

“The use of intelligently networked pollution detectors will give us unprecedented control over air and water quality.”
European Photonics - a strong investment case

Production Volume on Euro Basis*

<table>
<thead>
<tr>
<th>Year</th>
<th>Total in € bn</th>
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<tbody>
<tr>
<td>2005</td>
<td>€228 bn</td>
</tr>
<tr>
<td>2011</td>
<td>€350 bn</td>
</tr>
<tr>
<td>2015</td>
<td>€447 bn</td>
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</table>

* with Photovoltaics which is not subject of the PPP

Source: Optech Consulting Market Research Study 24.1.2017
Europe is an industry market leader in photonics segments where optics is a key element

Outgrowing global and European GDP

Source: Optech Consulting Market Research Study 24.1.2017
Europe’s Innovation Challenge

Superb Research Base

726k researchers in research institutes
1.88M researchers*
323k science and technology researchers

* In EU28 in 2015
$ In EU28 in 2014
The European research ecosystem struggles in bridging the innovation valley of death.
Technology Readiness Levels (TRLs) and the chasms in the innovation valley of death

The Innovation Chain: Converting Science to Wealth

Research organisations  Collaboration  Industry

Knowledge development  Technology development  Business development

TRL1: Basic principles observed  TRL2: Technology concept formulated  TRL3: Experimental proof of concept  TRL4: Technology validation in lab  TRL5: Tech. validation in relevant environment  TRL6: Demonstration in relevant environment  TRL7: Demonstration in operational environment  TRL8: System complete and qualified  TRL9: Successful missions operation

- Research to prove feasibility
- Technology development and prototypes
- Market launch and commercialisation

Basic Technology Research  Technology demonstrator  Pilot Plant and scale-up

BRIDGING THE VALLEY OF DEATH – “CRITICAL CHASM TO CROSS”

- Demonstration of conceptual breakthroughs
- Prototyping
- Scaling Manufacturability
The Innovation Chain: Converting Science into Wealth

Researchers

ACADEMIA

COLLABORATION

Companies

INDUSTRY

Knowledge Development

- TRL 1: Basic technology research
- TRL 2: Research to prove feasibility
- TRL 3: Technology development and prototypes
- TRL 4: Demonstration of conceptual breakthroughs
- TRL 5: Technology development and prototypes
- TRL 6: Market launch and commercialisation
- TRL 7: Pilot plan and scale up
- TRL 8: 
- TRL 9: 

Technology Development

Business Development

BRIDGING THE VALLEY OF DEATH – 3 CRITICAL CHASMS TO CROSS

- Demonstration of conceptual breakthroughs
- Simulating / Prototyping
- Scaling Manufacturability

TOWARDS AN INTEGRATED INNOVATION ECOSYSTEM
Current barriers for researchers in Europe to demonstrate their conceptual breakthroughs using advanced photonics

Huge number of researchers that could benefit from photonics are not even aware about it

Researchers have limited access to advanced photonics technology

No access to advanced photonics technology implies suboptimal solutions and no deployment
Current barriers for researchers in Europe to demonstrate their conceptual breakthroughs using advanced photonics:

- Lack of systematic Europe-wide vehicle to create integrated innovation ecosystem between academia and industry.
- Lack of services based on mature technology platforms to researchers in order to deploy technologies effectively.
- Grants to support fundamental research but limited grants to bridge from basic research to applied research and innovation aligned with commercial enterprises.
ACT PHAST4R | Photonics Technology Access for Researchers
ACTPHAST 4R: lowering the innovation barriers

- Provide access to advanced photonics platforms for photonics and non-photonics researchers.
- One-stop-shop access to mature technologies and expert coaches.
- Cross-fertilization with photonics is key.
- To prototype their proven conceptual breakthroughs.
Access to photonics and non-photonics researchers

- Providing access for both photonics and “non-photonics” researchers
- Many early stage concepts of new applications are cross-KET
- Cross-fertilisation of photonics with other KETs is a central component of innovation in the new digital economy.
Starting point: Conceptual breakthroughs

- Enabling researchers to work with advanced photonics technologies where the TRL of these technologies is already proven.
- However, the TRLs of the researchers’ concepts for applying these technologies are still at an early stage and they need access to the advanced technologies in order to demonstrate their conceptual breakthroughs by turning them into prototypes.
ACTPHAST 4R: one stop-shop access to mature technologies, experts, and coaches from 24 European partners
More than 200 photonics experts
free-space optics

specialty fibers

polymer-based optics

MOEMS

SiN-SiO PICs

Si-PICs

InP-PICs

7 Technology Platforms
Each technology platform is capable of supporting a full supply-chain from design to demonstrator.
TP1: Free-space photonic components and systems

Prototyping, Mastering and Replication

Optical Measurement and Characterization

Technology Supply Chain

Packaging

Modelling and Design

Demonstrators

TP1 responsible: Michael Vervaeke

Partners involved:

- VUB
- B-PHOT BRUSSELS PHOTONICS
- KIT
- STN
- IMT
- Warsaw University of Technology
- CNRS
- CD6
- UPC
- VTT
- imec
- ICFo
- Fraunhofer
- Consiglio Nazionale delle Ricerche
TP2: Glass and polymer specialty fibres and fibre devices

<table>
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<tr>
<th>VUB</th>
<th>B-PHOT BRUSSELS PHOTONICS</th>
<th>Southampton</th>
<th>Leibniz Institute for Photonic Technology (IPHT)</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>FORTH Institute of Electronic Structure and Laser</td>
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<td></td>
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<td>OPTICAL FIBRES, Optical Fibre Research Centre, University of Warsaw</td>
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<td></td>
<td></td>
<td></td>
<td>ITME, Warsaw University of Technology</td>
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</table>

TP2 responsible: Francis Berghmans
TP3: Polymer-based photonic components and large-area organic-photonics

Mastering and Prototyping Technologies

Optical Measurement and Characterization

Technology Supply Chain

Low-Cost Low-Volume Replication

Optical Modelling

Demonstrators and Prototypes

TP3 responsible: Jurgen Mohr

Partners involved:

Karlsruhe Institute of Technology
KNMF
IMT
VUB
B-PHOT BRUSSELS PHOTONICS
CNRS
JOANNEUM RESEARCH MATERIALS
Warsaw University of Technology
imec
VIT
Tyndall National Institute
Holst Centre
PCL
UNIVERSITY OF EASTERN FINLAND
Fraunhofer
TP4: Micro-Opto-Electro-Mechanical Systems

TP4 responsible: Nadège Courjal

Partners involved:

1. adapted design & simulation of MEMS, microoptical components and systems
2. integration of MOEMS with micromachining technologies
3. heterogeneous & hybrid 3D integration and packaging of MOEMS
4. static & dynamic characterization of MEMS and MOEMS
5. implement & test the functional demonstrators

MEMS/MOEMS Characterization

Micromachining

Technology Supply Chain

3D Integration

Holder with silicon microstructure

Warsaw University of Technology

JOANNEUM RESEARCH MATERIALS
TP5 : Silicon Photonic Integrated Circuits

TP5 responsible: Dries Van Thourhout

Partners involved:

IC prototyping
Testing
Packaging and hybrid integration
Reliability testing
TP6: InP-based Photonic ICs

Optical switching
4x4 space and wavelength selective switch
Fast optical switch matrix

Fiber sensor readout
Brillouin strain sensor readout
Fiber Bragg Grating readout

Variety of lasers
Widely tunable ring laser
Variable repetition rate pulse laser
Filtered-feedback multi-wavelength laser
tunable laser with integrated MZI modulator

Optical data handling
All-optical regenerator for constant envelope WDM signals
WDM to TDM Trans-Multiplexer
Pulse serialiser

Fiber to the home
WDM receiver
WDM transmitter

Medical and bio-imaging
Pulse shaper for bio-imaging

TP6 responsible: Kevin Williams
Partners involved:
TP7: Si3N4 and SiO2 passive waveguide technologies

TP7 responsible: Arne Leinse

Partners involved:

Lionix International

cnit

Holst Centre

IMEC

PCRL
ACTPHAST 4R: the basic concept

- Intensive innovation projects coached by photonics expert teams
- Internships to the mature technology platforms for intense in-person training
- Hands-on training and learning by doing
- Bring the conceptual breakthrough to TRL levels 4-5
- Business/entrepreneurial coaching to improve mindset for accelerated deployment
- Pathways for further deployment
Turning breakthrough concepts into demonstrators

- Intensive innovation projects between the researchers and the ACTPHAST 4R Partners
- guided by senior experienced experts in the relevant technology platforms
- to successfully build and deliver demonstrators to TRL4-5 for the researchers’ breakthrough concepts
Maximizing Knowledge Transfer

- Internship for researchers at one or more of the ACTPHAST 4R Partners for the relevant photonics technology platforms
- to facilitate more **intense** in-person training and to stimulate higher levels of **knowledge transfer**
Learning by doing

• Opportunity when possible for hands-on working by the researchers themselves with the technology platform and the advanced photonics technologies

• to facilitate enhanced “learning by doing” for increased technical skills and competences as well as knowledge
Improve mindset for accelerated deployment by coaching

- Parallel coaching by experienced ACTPHAST 4R business development experts on the key principles of technology entrepreneurship and valorisation (business / entrepreneurial coaching)
- in particular covering the key principles of the Investment Readiness Levels (IRL) of new technologies and market-oriented applications aligned to TRL advancement
- to help create an improved mindset for accelerated deployment of the photonics technologies.
Pathways for further development of demonstrators

• Introducing researchers through ACTPHAST 4R to the **pathways for further development** of their **demonstrators**

• through **ACTPHAST 4.0** and the **Pilot Lines**, thereby facilitating improved transfer of scientific breakthroughs to industry

• **strengthening the European innovation ecosystem** and improving cross-fertilisation of advanced photonics technologies across multiple domains and applications.
A COMPREHENSIVE EUROPEAN INNOVATION ECOSYSTEM

BRIDGING THE VALLEY OF DEATH – “CRITICAL CHASMS TO CROSS”

Demonstration of conceptual breakthroughs

Prototyping

Scaling Manufacturability
From “first contact” to “project host appointment”

**PHASE 1: SCOUTING**

- Discuss the innovation request
- Can ACTPHAST 4R help?
- Maturity of conceptual breakthrough
- Commitment of researcher
- Intellectual Property
- TRL level
- Supporting letter from PI
- Potential impact
# LEAN CANVAS MODEL

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
<th>Unique Value propositions</th>
<th>Unfair Advantage</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>List your top 1-3 problems</td>
<td>Outline a possible solution for each problem</td>
<td>Single, clear, compelling message that states why you are different and worth paying attention.</td>
<td>Something that cannot easily be bought or copied.</td>
<td>List your target customers and users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Existing Alternatives</th>
<th>Key Metrics</th>
<th>Channels</th>
<th>Early Adopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>List how these problems are solved today</td>
<td>List the key numbers that tell you how your business is doing</td>
<td>List your path to customers (inbound or outbound)</td>
<td>List the characteristics of your ideal customers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost structure</th>
<th>Revenue Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>List your fixed and variable costs.</td>
<td>List your sources of revenue.</td>
</tr>
</tbody>
</table>
Project proposal phase through interaction with your host

**PHASE 2: PROPOSAL**

- Researcher in concert with the host writes proposal
- TCT evaluates proposal
- Focus on
  - Role of researcher and role of the host
  - Goals of the innovation project
  - Target of knowledge gain through the project
  - Description of the demonstrator
  - Description of the internship and the hands-on
“Execution phase” and “impact measurement”

Execution phase

- 0-12 WEEKS
- PROPOSAL GRANTED
- PROGRESS REPORT
- CONSENSUS REPORT
- BUSINESS CANVAS COMPLETED
- CUSTOMER SATISFACTION
- FINAL LEVEL BUSINESS COACHING
- PERIODIC IMPACT MEASUREMENT

PROGRESS AND CUSTOMER SATISFACTION MONITORED BY CCP
Summary of the steps to successful photonics innovation

Step 1: Register your interest
Step 2: Follow online intro-module of the deployment training
Step 3: Pre-application form
Step 4: Scouting engagement
Step 5: Outcome of the scouting phase
Step 6: Innovation project proposal
Step 7: Evaluation of the project proposal
Step 8: Contract signature and Kick-off
Step 9: Innovation support project
Step 10: Finalising the innovation support project

Targeted number of participants:
- 1200
- 800
- 420
- 120
- 100

Selection:
- How unique is your application?
  - What are the potential application domains?
  - Self-assessment
- Assessment based on:
  - Self-assessment
  - Support letter TTI
- The Lean Canvas
  - Intermediate self-assessment
- Assessment based on:
  - Lean canvas + self-assessment
  - Needed technology
- Final innovation project proposal
  - Final self-assessment
- Assessment based on:
  - Final innovation project proposal (including lean canvas, internship)
  - Training & hands-on coaching plan

Selection:
- Innovation project
- Online Business Module 3 + routes 1 & 2
- Re-iteration business trust

Selection:
- Start-up
- Pitch talk
- IP validation
Innovation support for researchers is subsidized for strongly committed research organisations.

- **PROJECT COSTS BELOW 30€**: 100% SUBSIDIZED
- **PROJECTS COSTS ABOVE 30€**: 75% SUBSIDIZED
Who is eligible for what ACTPHAST support?

- MOOC is always offered for European researchers

- Scouting can be funded except for photonics researchers from ACTPHAST

- Project support costs can be covered up to 100K Euro for transnational projects except when the researchers are from ACTPHAST

- Researchers will pay always for their travel and accommodation related to internship.

- The access center can also host researchers that have EU grants but the project cost have to be covered by the EU grant. (no double funding)
40,000 researchers increased photonics awareness / 1,200 high quality support requests

100 researchers have intensive business coaching for completion of Business Canvas model

100% transnational projects across 20 member states

Overall satisfaction level: 4/5 “Very Good”

20 IP transfer and technology licensing agreements with industry

200 researchers have increased knowledge in technology entrepreneurship

80 new demonstrators with potential for scaling

80% average project duration

R&I expenditure leverage of factor 2

Early incubation of 10 spin-outs creating 50 high tech jobs

400 researchers receive focused technology coaching

60% cross-KET projects by non-photonics researchers

Cross-fertilization of projects across 10 different non-photonics domains

50 joint publications

15M€ further growth capital raised (project, seed and VC funding)

100 innovation projects with internships and hands-on

40% projects by photonics researchers

TRL advancement by 2 levels per innovation project

30 IP depots / patent applications or strengthened patents

Best practice models developed for innovation co-funding with 5 EU regions
Accelerating Photonics Innovation

Want to innovate with photonics?
But don’t have access to the right expertise or technologies?

ACTPHAST 4R  ACTPHAST 4.0
Photonics Technology  Photonics Innovation
Access for Researchers  Incubator for SME’s

ACTPHAST will get you from Concept to Prototype....
Faster, At Less Cost, With Greater Impact

REGISTER YOUR INTEREST NOW ON WWW.ACTPHAST.EU
ACTPHAST 4R provides photonics and non-photonics researchers with one-stop-shop access to a wide range of existing cutting edge photonics technology platforms from Europe’s top research centres.
ACTPHAST provides photonics and non-photonics companies and researchers with one-stop-shop access to a wide range of existing cutting edge photonics technology platforms from Europe’s top research centres.

The ACTPHAST network offers a single streamlined way to access 200 of the best experts and technologies from 24 of Europe’s leading photonics research institutes, covering the entire supply chain to accelerate the demonstration of exciting new scientific breakthroughs towards a working prototype, and beyond into mass manufacturing.

Register your interest as Researcher  Register your interest as a Company

A unique one-stop-shop solution for supporting photonics innovation in European