



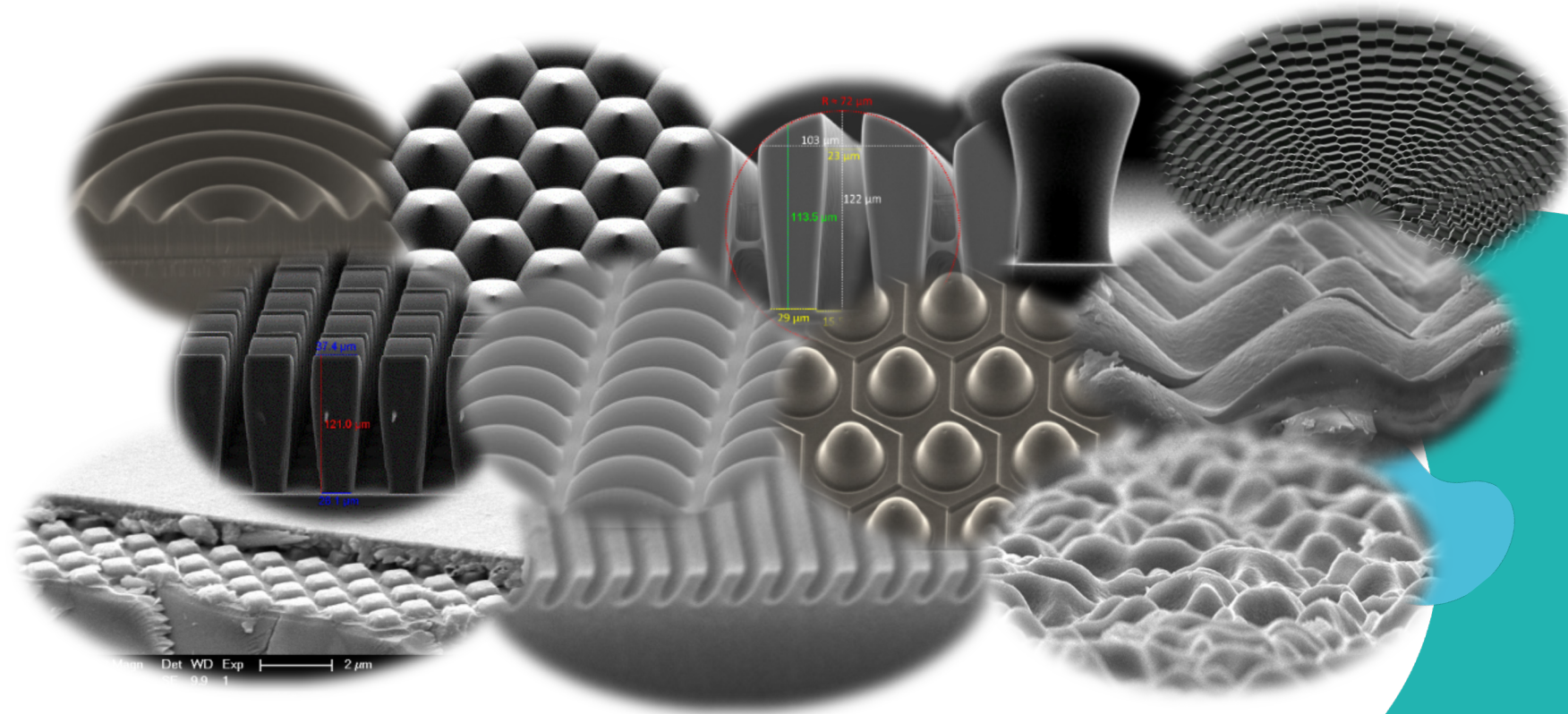
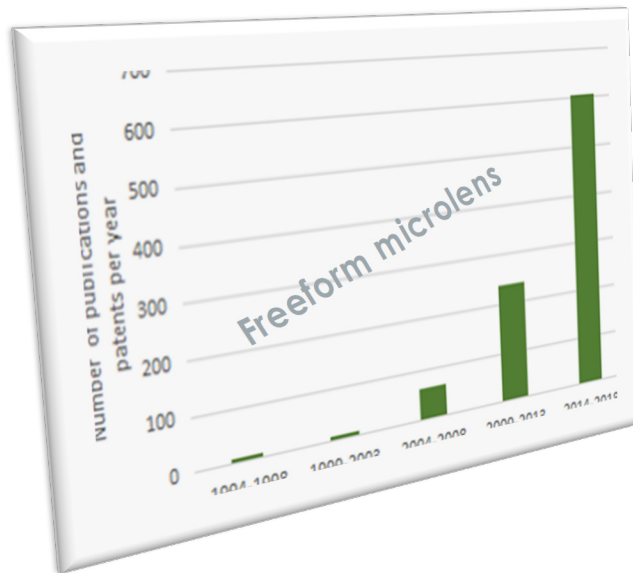
THE EUROPEAN **PILOT LINE** AND ONE-STOP-SHOP  
FOR THE MANUFACTURING OF **FREE-FORM MICRO-OPTICS**



# Free-form micro-optics (FFMO)

## Free-form micro-optics consists of optical components

- **with no symmetry constraints**
- **gaining an increasing industrial interest in the last few years**



MICRO-OPTICS IS...

# Phabulops

... is the European **pilot line** and **one-stop-shop**  
for the manufacturing of **free-form micro-optics**

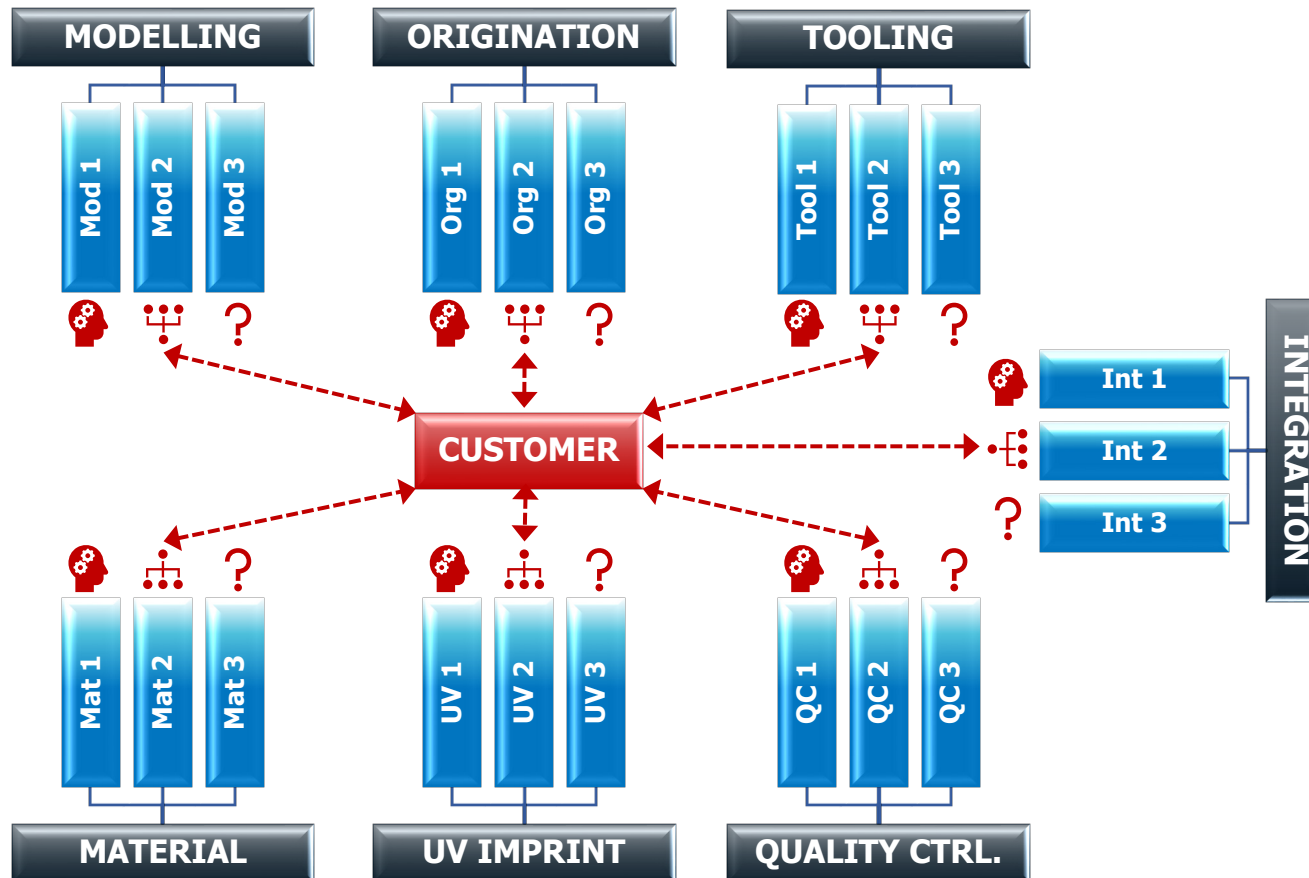
... offers

- **accelerated innovation & production cycles**
- **manufacturing services**
- **prototyping → piloting → large volume production**



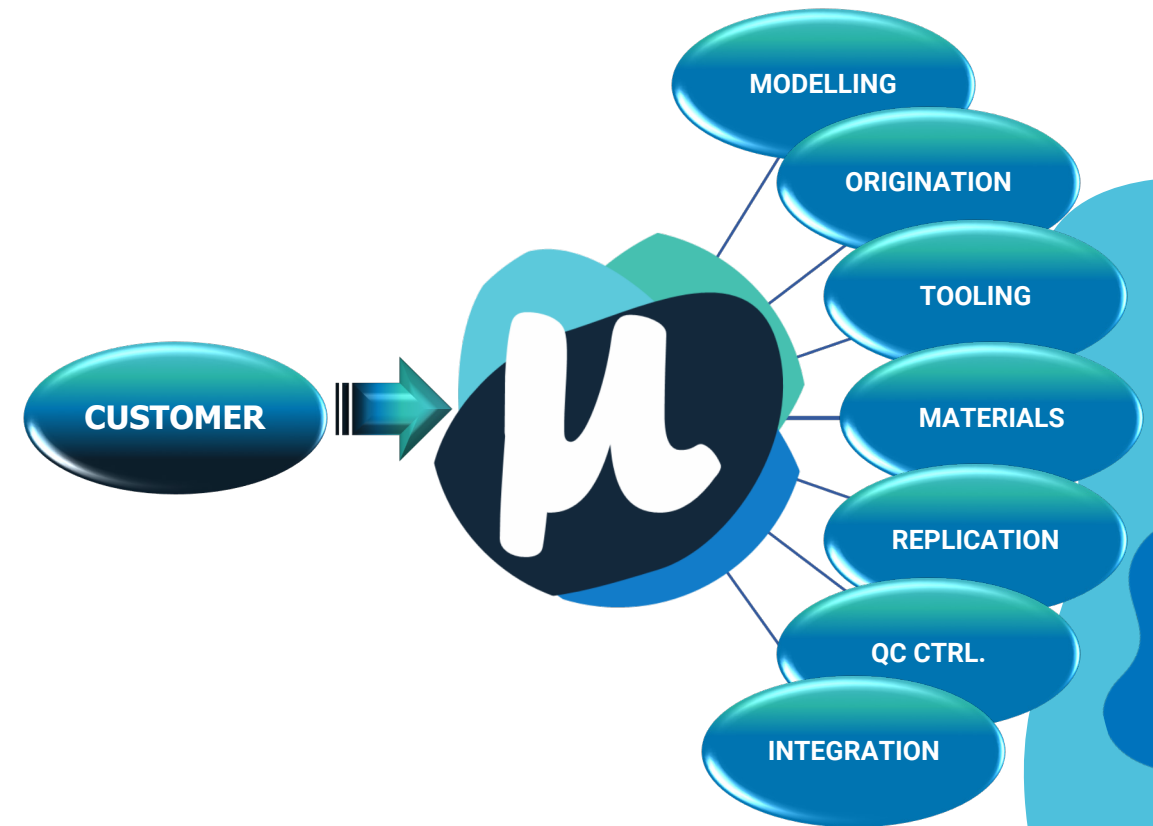
# Single Entry Point

## Without PHABULOuS



# phabulous

## With PHABULOuS

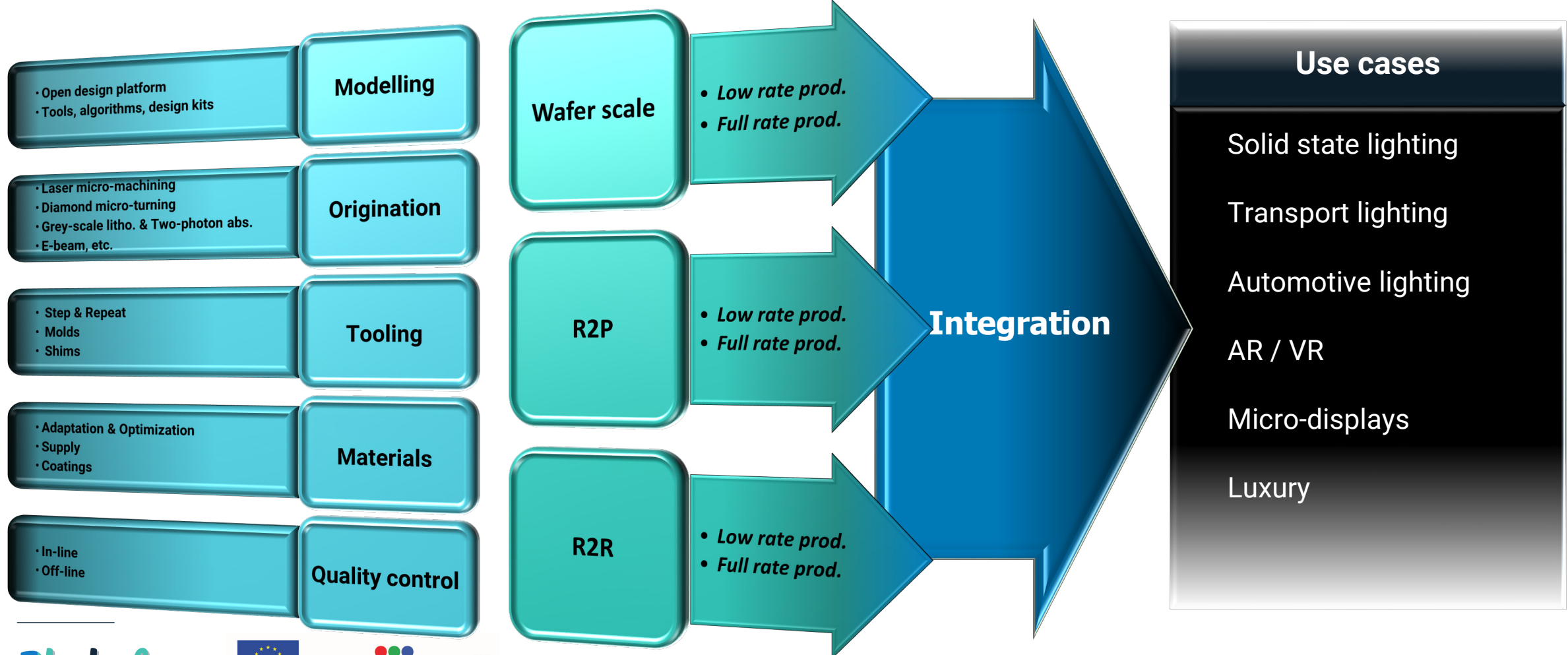




# Our Services

## Production Services & UV imprint manufacturing

## Product integration Technology validation



# Phabulous

Funded by



PHOTONICS PUBLIC PRIVATE PARTNERSHIP

PHOTONICS<sup>21</sup>



**25 May 2022, 9:00 - 12:00 CEST**

**PHABULOuS Online Workshop**  
**free-form micro-optics for automotive**

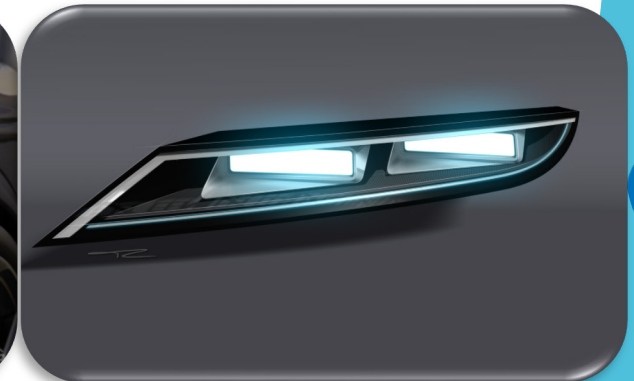
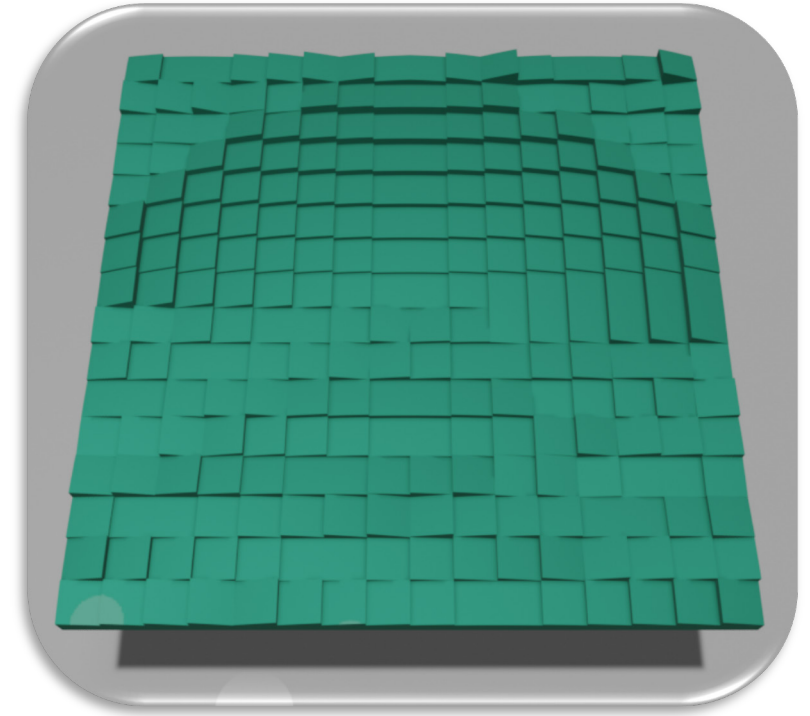
# Automotive functional lighting

- Enabling the manufacturing of complex free-form micro-optic applications that meet automotive requirements
- Benefit of FFMO is to reduce the redundancy of additional lenses such as primary optics for headlamps.
- Increase of efficiency compared to other micro-optical approaches.



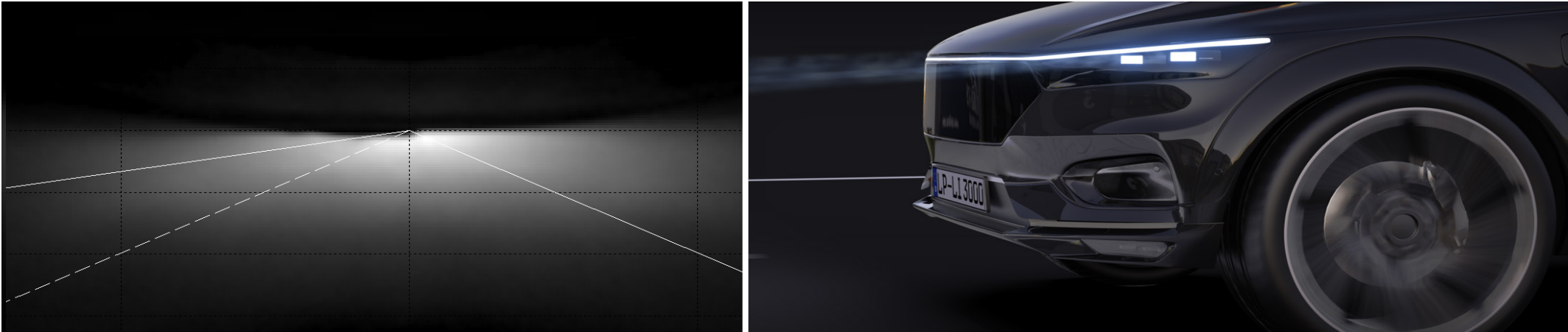
# FFMO for automotive: Advantages

- Free-form micro-optics allows the combination of complex optical functions inside one unique thin optical element.
- Multiple optical surfaces can be reduced to one single optical element.
- The complexity of headlamps will be simplified.



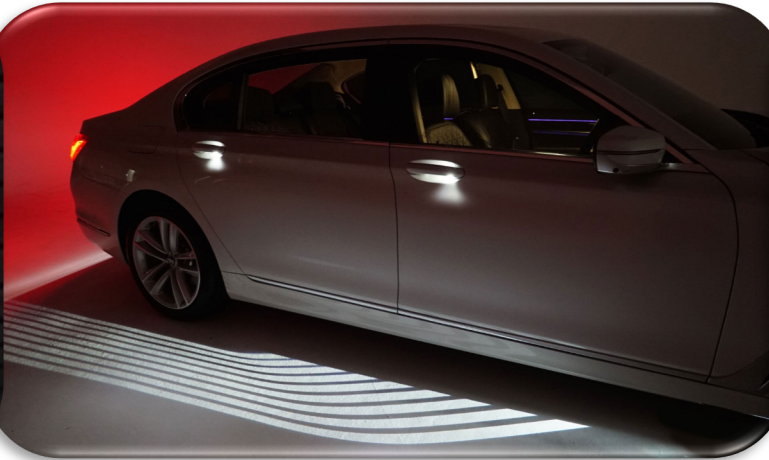
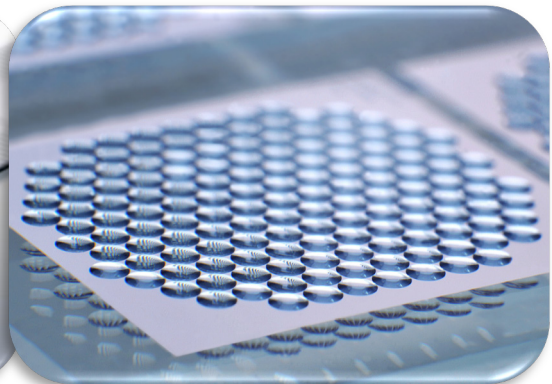
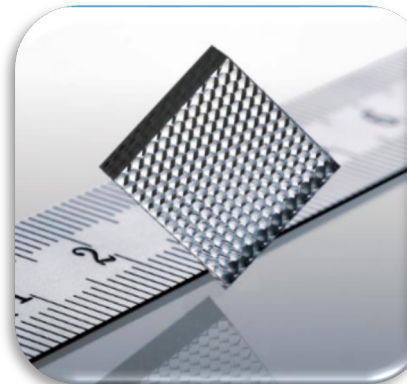
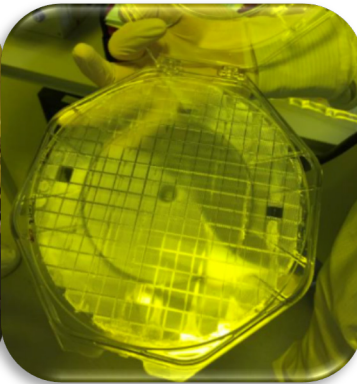
# FFMO for automotive: Headlamps

- Realization of the main light functions low and high beam are the targets.
- Aim are headlights with uniform appearance in the on/off state, yielding a high beam and an asymmetric low beam with a homogenous light distribution and low stray light, low installation space and low weight.





# Micro-lens arrays for light-carpets



# Micro-optics for other automotive applications

- Interior Lighting
- Heads-up displays
- Infotainment systems



# Advanced free-form micro-optics

- Support for all phases of development, from design and prototyping, to replication and integration
- Through a single entry point

[www.phabulous.eu](http://www.phabulous.eu)





# Open Call

## Funding opportunity to implement free-form micro-optical components

... is open to all European companies (+ more)

... fundings up to 90%

... continuous open call with cut-off dates:  
end of March, **June**, November **2022** +2023

[www.phabulous.eu/open-call](http://www.phabulous.eu/open-call)







# We are PHABULOuS

- **Single entry point** to access design and manufacturing services for free-form micro-optical components.
- Access to **Europe's leading Companies** and Research & Technology Organizations that cover the full value chain.
- **Promotion of the capabilities** and advantages of integrating free-form micro-optics.



# Ecosystem & Marketplace

- ... launched in November 2021
- ... showcases extensive product offerings for free-form micro-optics
- ... is open to all suppliers and companies active in the field of micro-optics
- ... aim is to become the main source for orientation towards implementation of free-form micro-optics




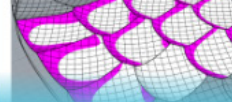








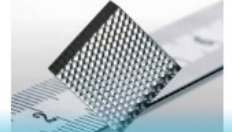

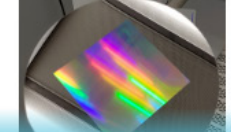

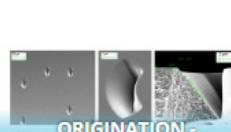


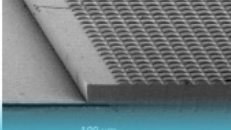

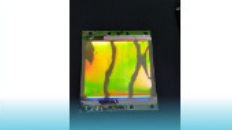
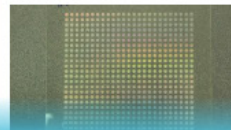
Register at [ecosystem.phabulous.eu/](https://ecosystem.phabulous.eu/)



# Organisation Registry

 <p>3D AG</p>	 <p>AMIRES S.R.O.</p>	 <p>AXETRIS AG</p>	 <p>CEA</p>	 <p>CORNING LASER TECHNOLOGIES GMBH</p>	 <p>CSEM SA</p>	 <p>EPIC - EUROPEAN PHOTONICS INDUSTRY CONSORTIUM</p>
 <p>FEMTOPRINT</p>	 <p>FOLEX AG</p>	 <p>FRAUNHOFER FEP</p>	 <p>HELLA GMBH &amp; CO. KGAA</p>	 <p>JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH</p>	 <p>JOYA TEAM</p>	 <p>LASEA</p>
 <p>LIMBAK</p>	 <p>MICRORELLEUS, S.L.</p>	 <p>MORPHOTONICS B.V.</p>	 <p>NANOCOMP OY LTD</p>	 <p>NANOSCRIBE GMBH &amp; CO. KG</p>	 <p>PHABULOUS PILOT LINE ASSOCIATION</p>	 <p>POWERPHOTONIC LTD</p>
 <p>STANDEX INTERNATIONAL</p>	 <p>SUSS MICROOPTICS</p>	 <p>VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD</p>	 <p>WIELANDTS UPMT</p>			

# Marketplace for Automotive

<p>Member</p>  <p>ADVANCED DESIGN OF FREE-FORM OPTICS</p>	<p>Member</p>  <p>ADVANCED LASER ABLATION</p>	<p>Member</p>  <p>ASPHERICAL MICROLENS AND MLA ON SILICON AND GLASS WAFER</p>	<p>Member</p>  <p>DESIGN &amp; DESIGN FOR MANUFACTURING</p>	<p>Member</p>  <p>ELECTROFORMING NICKEL SHIMS MOLDS FOR REPLICATION</p>	<p>Member</p>  <p>FEMTOSECOND LASER MICROSTRUCTURING SERVICES IN 5 AXIS</p>
<p>Member</p>  <p>HEADLAMPS WITH MICRO- OPTICS</p>	<p>Member</p>  <p>CHARACTERIZATION &amp; QUALITY CONTROL</p>	<p>Member</p>  <p>LASER DICING OF GLASS BASED WAFER LEVEL MANUFACTURED PRODUCTS</p>	<p>Member</p>  <p>LENS ARRAYS &amp; LENS ARRAY MASTERS</p>	<p>Member</p>  <p>MICRO- AND NANO LASER STRUCTURING</p>	<p>Member</p>  <p>MICRO-LENSES &amp; MICRO- LENS ARRAYS</p>
<p>Member</p>  <p>MICROIMPRINT ON WAFER LEVEL</p>	<p>Member</p>  <p>NANOIMPRINT (REPLICATION OF NANO/MICRON TEXTURES)</p>	<p>Member</p>  <p>NANOIMPRINT AT WAFER- SCALE</p>	<p>Member</p>  <p>ORIGINATION</p>	<p>Member</p>  <p>ORIGINATION - GRAYSCALE DIRECT WRITE LASER LITHOGRAPHY</p>	<p>Member</p>  <p>ORIGINATION - MICROLENS ARRAY</p>
<p>Member</p>  <p>R2R ASSEMBLY PILOT LINE</p>	<p>Member</p>  <p>REPLICATION AT WAFER- SCALE</p>	<p>Member</p>  <p>REPLICATION BY R2P</p>	<p>Member</p>  <p>TOOLING (ELECTRO- FORMING)</p>	<p>Member</p>  <p>TOOLING (STEP &amp; REPEAT)</p>	



# Pilot Line Front Office

- Apply for our services
- Join the ecosystem
- Contact us
- Follow us

[info@phabulous.eu](mailto:info@phabulous.eu)

[www.phabulous.eu](http://www.phabulous.eu)

 @PHABULOU\_S\_eu

 PHABULOU\_S Pilot Line

 PHABULOU\_S EU



MICRO-OPTICS IS...

**Phabulous**



**Jessica van Heck**  
Managing Director

[jessica.vanheck@phabulous.eu](mailto:jessica.vanheck@phabulous.eu)



**Ton Offermans**  
Technical Coordinator

[ton.offermand@phabulous.eu](mailto:ton.offermand@phabulous.eu)



MICRO-OPTICS IS...

Phabulous

csem

JOANNEUM  
RESEARCH

VTT

Fraunhofer  
FEP

SUSS  
MicroOptics

leti  
C23tech



morphotonics

NANOCOMP

Wielandts  
upmt

LASEA

limbak



PowerPhotonic

microoLED



SEISENBACHER

SWAROVSKI



ZUMTOBEL

EPIC  
European Photonics  
Industry Consortium

AMIRÉS

phabulous



PHOTONICS<sup>21</sup>

PHOTONICS PUBLIC PRIVATE PARTNERSHIP

MICRO-OPTICS IS...

Phabulous

Thank You



PHOTONICS<sup>21</sup>

PHOTONICS PUBLIC PRIVATE PARTNERSHIP