

MICRO-OPTICS IS...

Phabulous



Annual Report 2023



www.phabulous.eu

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The development of the association towards sustainability

Our association has now been in existence for more than 3 years and it is time for a first summary and an outlook.

Over the past year, we have been able to achieve some important development steps. The Pilot Line Front Office has become the actual center of activities. The visibility of the association was raised to a new level and this made it possible to generate interest in many areas of application. I would like to thank our key person Jessica for being very active and not losing the energy to drive development forward. Thanks to her efforts, we are now known to a large audience and have access to various markets.

There is a great demand for the technology, from Europe and beyond, which is reflected in the number of contacts and conversations we have at conferences, trade fairs and via our online platform. But the number of concrete inquiries and pilot projects carried out falls short of our expectations. We have to admit to ourselves that the business model as developed in the initial phase of the project needs to be revised and that the market access strategy needs to be adapted to the main category of customers, in our case spin-offs and SMEs that want to explore the technological potential without an immediate need for large production volumes. Ideas have been collected, initial measures have been taken, but we still have a lot to do.

It was a year of many challenges and opportunities, during which a number of pilot projects were launched. The association has achieved an alignment of project requirements and customer wishes, and we have introduced a new tool to increase responsiveness and flexibility towards customers: the feasibility study. We hope that we are now on the right track to support both direct customers and new pilot cases that will come in 2023.

We have also decided to shift up a gear in the management team. New team members have been brought on board for 2024 to accelerate activities and prepare a stable and sustainable front office for the association.

We look to the future with optimism, and the growing activities and presence of the association give us the right to do so. Let's seize the opportunity to make 2024 an exceptional #phabulous year for our association.

Toralf Scharf

President PHABULOus Pilot Line Association



The Association

The PHABULOuS Pilot Line Association is established to function as the entry point for (potential) customers interested in the services of the Pilot Line members. The Association is an independent legal entity with legal capacity governed by the bylaws signed by its thirteen Founding Members.

Objectives

The PHABULOuS Pilot Line Association is established within the framework of the H2020 European research project entitled "Pilot-Line Providing Highly Advanced & Robust Manufacturing Technology for Optical Free-Form Micro-Structures" funded by the European Commission ("PHABULOμS Project").

The main objectives of the PHABULOuS Pilot Line Association are to:

- Implement the PHABULOμS Project in accordance with the Grant Agreement n°871710.
- Unify European research and technology organisations and industrial partners into a Pilot Line for the design and manufacturing of free-form micro-optics solutions.
- Test the efficiency of the pilot line concept through the validation of requests for piloting services within the implementation of the PHABULOμS Project.
- Promote advanced micro-optics technologies and solutions and offer a single-entry point (one-stop shop) in order to facilitate access to comprehensive problem-solving competency for the complete production chain.
- Represent the interests of the micro-optics community on a national and international basis.

Board of Directors

The PHABULOuS Pilot Line Association is owned by its members and managed by its board of directors:

- Toralf Scharf (President), Director Technology at Focuslight Switzerland (Switzerland)
- Paul Hartmann (Vice-President), Director of Institute MATERIALS at Joanneum Research (Austria)
- Philippe Steiert, Director of CSEM Regional Centers at CSEM (Switzerland)
- Jan-Matthijs ter Meulen, CTO and Co-Founder at Morphotronics (Netherlands)
- Veli-Pekka Leppänen, CEO and Co-Founder at Nanocomp (Finland)
- Richard Clark, Finance Director at PowerPhotonic (United Kingdom)



Pilot Line Front Office

The daily operations of the PHABULOuS Pilot Line Association are run by the Pilot Line Front Office (PLFO):

- Jessica van Heck, Managing Director
- Ton Offermans, Technical Coordinator



Members

The PHABULOuS Pilot Line Association has 12 members from 9 countries:

- CSEM (Switzerland)
- Joanneum Research (Austria)
- Fraunhofer FEP (Germany)
- CEA-Leti (France)
- Focuslight Switzerland (Switzerland)
- Morphotonics (Netherlands)
- Nanocomp (Finland)
- Wielandt UPMT (Belgium)
- LASEA (Belgium)
- PowerPhotonic (United Kingdom)
- EPIC (France)
- AMIRES (Czech Republic)

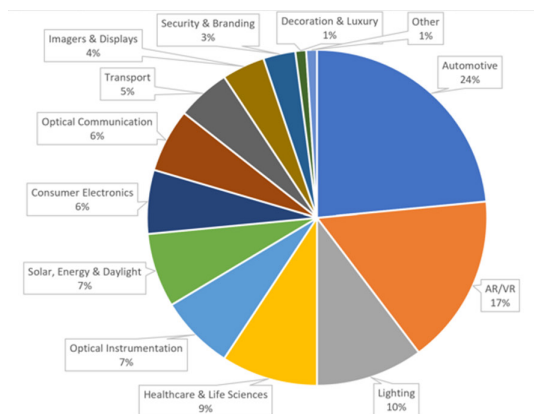


Markets & Customers

With the Pilot Line Front Office fully launched and the implementation of the CRM, the association has logged several request for a wide range of markets and application. This has provided a lot of marketing intelligence which will be further processed in the market readiness survey deliverable that is due in 2024. Here we already include some first results.

Market analysis

At the end of 2021, the PLFO started working with a CRM system to log activities. 291 leads were registered and assigned to one of the initial markets identified. The main interest continues to come from the lighting, automotive and AR/VR industry. New emerging markets in 2024 include healthcare & life sciences and optical communication. 82% of leads is coming from European countries, 10% of coming from the United States and another 8% from other countries.



Pilot case proposals


In 2023, we received 5 new submissions through the open call portal, of which 4 were evaluated positively. That brings the total of pilot case submissions to 11. Here is the overview of all received proposals:

- Free-form lens for laser beam scanner for augmented reality application
- Light scattering structure for Greenhouses
- Single Point Diamond Turning of Hybrid Lens for Virtual Reality
- Plate based nanoimprinting for disruptive eyewear
- Microscopy slide for early, high-sensitivity Tuberculosis diagnosis
- Freeform Optics for NIR Emitter Array
- Freeform imaging-grade monolithic polymer components for low- to high-volume applications
- Wafer level lens stack optimized free form elements for microcamera modules in medical applications
- Expanded beam connector for datacom
- Scalable Optical and Fluidic Packaging of Plug-and-Play PIC Sensors
- Hybrid micro-prisms for ophthalmic correction

In total, 5 contracts were signed which cases are in execution. All will be finalised by the end of 2024 and be reported in our annual report for 2024.

Feasibility study

The open call closed at the end of 2023, but in order to continue supporting customers, also with funding, we launched in October 2023 the PHABULOuS Feasibility Studies for which we received a first shortly after. The feasibility will remain available as long as there is funding and is expected to close by summer of 2024.



Solve your free-form micro-optics implementation questions

START A *FEASIBILITY STUDY* with the *PHABULOuS PILOT LINE*

- get up to 2 months of development effort from our partners!
- with a maximum contribution of 2000€
- simple proposal process and quick evaluation

This is a **new service for European companies.**

[Download the application form](#), fill it in and send to helpdesk@phabulous.eu.

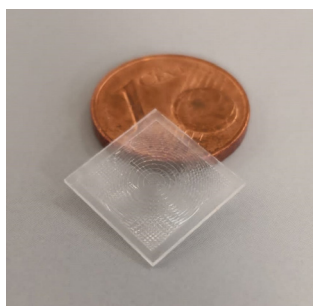
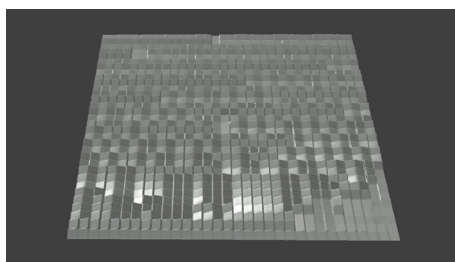
Use Cases

In 2023, all demonstrators of our use cases inside the project were finalised and made available.

AUTOMOTIVE FUNCTIONAL LIGHTING

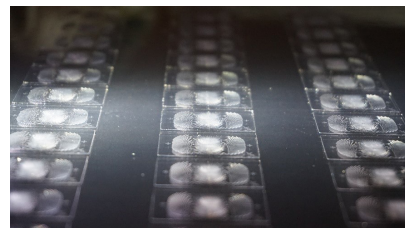
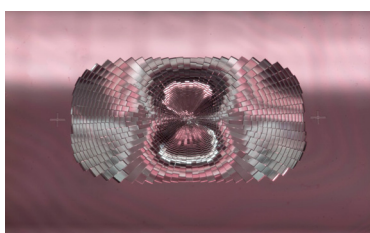
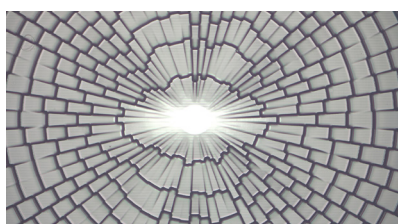
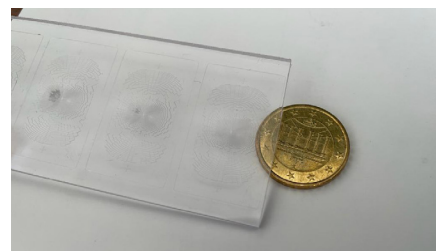


The idea of the HELLA design concept is the generation of a double-sided FMLA, using a structure for pre-forming the light on the light entrance side and a free-form facet structure on the light output side. The result is a double-sided FMLA with on one side a micro-fresnel lens and on the other side a facet array. The structures were originated by Wielandts UPMT and PowerPhotonic, and replicated and combined by Focuslight and Nanocomp.



TRANSPORTATION INTERIOR LIGHTING

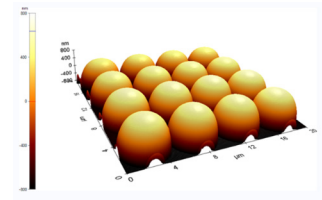
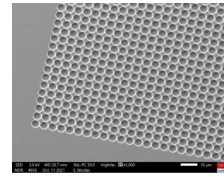
SEISENBACHER joined PHABULOUS looking to develop ultrathin luminaires (thickness <10 mm) or luminaires with a significantly reduced number of LEDs (less than half for linear lighting) and a customized shape of illumination pattern due to free-form micro-optical films. For SEISENBACHER a micro-optical component was developed to be integrated in their luminaires. Mastering and upscaling was done by Joanneum Research, tooling by CSEM, and replication by Morphotonics.



MICRO DISPLAYS FOR AUGMENTED REALITY

MICROOLED

For MICROOLED it was important to control the angular shape of light output and enhance the brightness of the OLED micro-display components. Mastering of the optics were done by CEA-Leti and Nanocomp and the replication was done by Focuslight.

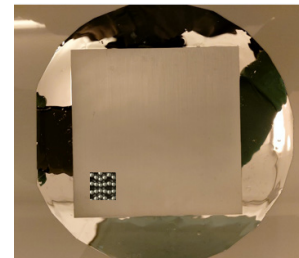


SOLID STATE LIGHTING



ZUMTOBEL

Zumtobel designed an optic to achieve a high asymmetric, homogeneous distribution. For the origination different technologies have been benchmarked from Pilot-Line partners Joanneum Research, PowerPhotonic, Wielandts UPMT and LASEA. For creating the tools, also the Step & Repeat (S&R) process of Joanneum Research have been implemented. The replica's were made on plate by Morphotonics and Focuslight. Joanneum Research and Nanocomp made imprints in Roll-2-Roll (R2R) technology for lower structure heights. For quality control the Pilot-Line partners Fraunhofer FEP, Wielandts UPMT, Focuslight, PowerPhotonic and Morphotonics were included.



LUXURY

SWAROVSKI

Swarovski designed a free-form micro-optics structure based on the faceted-structure of cut crystals. Different regular and irregular one- and double-sided structures were created and evaluated - always aiming for the highest sparkle. Origination was done by Joanneum Research, PowerPhotonic and Wielandts UPMT. Roll-2-roll replication was done by Joanneum Research and Nanocomp. Furthermore Master 2 was successfully replicated roll-2-plate on a glass substrate by Morphotonics. Silver mirror on the back of the structure was applied roll-2-roll by Fraunhofer FEP.



Collaborations

Our continued collaborations with other European projects and pilot lines supported in the outreach. Several collaborative actions have been done in 2023:

- JePPIX Pilot Line: shared booths and information exchange
- MedPhab Pilot Line: shared booths and information exchange
- PhotonHub: partner / active participation
- PULSATE: information exchange



PHABULOuS is also actively seeking our collaborations with other European associations:

- EPIC: membership and participation at several events
- Photonics Austria: membership and participation events
- Photonics Finland: participation events
- OptecBB: joined event
- Swissphotonics: membership and participation events



Social Media

PHABULOuS utilises several social media systems to reach its community and gain visibility. In 2023, the open call was a key push of information for the ecosystem, but also events, new entries in the ecosystem community platform and other relevant updates were communicated to the ecosystem. Here some statistics of our social media profiles for 2023.

LinkedIn:

- 1020 followers (+429)
- 65 posts
- 70K+ impressions

Twitter:

- 325 followers (+ 106)
- 281 tweets
- 23K+

YouTube:

- 63 subscribers (+ 31)
- 23 new videos
- 1.7+ views



Dissemination

PHABULOuS is visible at many events, both through the efforts of dissemination and communication partner EPIC, the Pilot Line Front Office, as well as through the efforts of the its members. In 2022, PHABULOuS was visible at the following events.

Exhibitions (booth)

- Photonics West, USA
- OFC, USA
- W3+ Fair, Germany
- LASER World of Photonics, Germany
- ECOC Exhibition, UK
- AWE, USA



Conferences & Seminars

- Photonics Spectra Conference, USA
- Pilot Lines & Photonics Innovation Hubs Breakfast, USA
- High Level Expert Meeting (HLEM 2023), Germany
- Ultra Precision Manufacturing Workshop, Germany
- EPIC Meeting on Photonics for AR/VR/MR, Germany
- Photonics 4 Industry event by Photonics Austria, Austria
- Optics & Photonics Days (OPD), Finland
- EPIC Meeting on Micro-Optics at the Laser World of Photonics, Germany
- Micro-optics Online Conference, Online
- AR, VR, and MR Displays conference, Online



Workshops & Webinars

- Webinar on free-form micro-optics for fibre coupling
- PHABULOuS Workshop on Free-form micro-optics for lighting, Online
- PHABULOuS / OpTecBB webinar on the revolution in free-form micro-optics
- PHABULOuS Online Workshop on Freeform Micro-optics for Consumer Electronics



Meetings

- EPIC Online Technology Meeting on Metamaterials and Metalenses
- EPIC Online Technology Meeting on Micro LED for Automotive Applications
- Swissphotonics Lunch Chat
- EPIC Online Technology Meeting on Additive Manufacturing
- EPIC Online Technology Meeting on Photonics for Wearables
- EPIC Technology Report on Freeform Optical Systems by Oliver Faehnle
- Prague Next-Gen Technology Meet-up

PHABULOUS on Tour

- Finland - we organised a company tour in Finland. We visited companies in Oulu, Joensuu, Tampere, Lahti and Helsinki / Espoo. In total we visited 18 companies in 5 days.

MICRO-OPTICS IS... **Phabulous**

PHABULOUS ON TOUR – FINLAND EDITION

Water scale
R2P
R2R

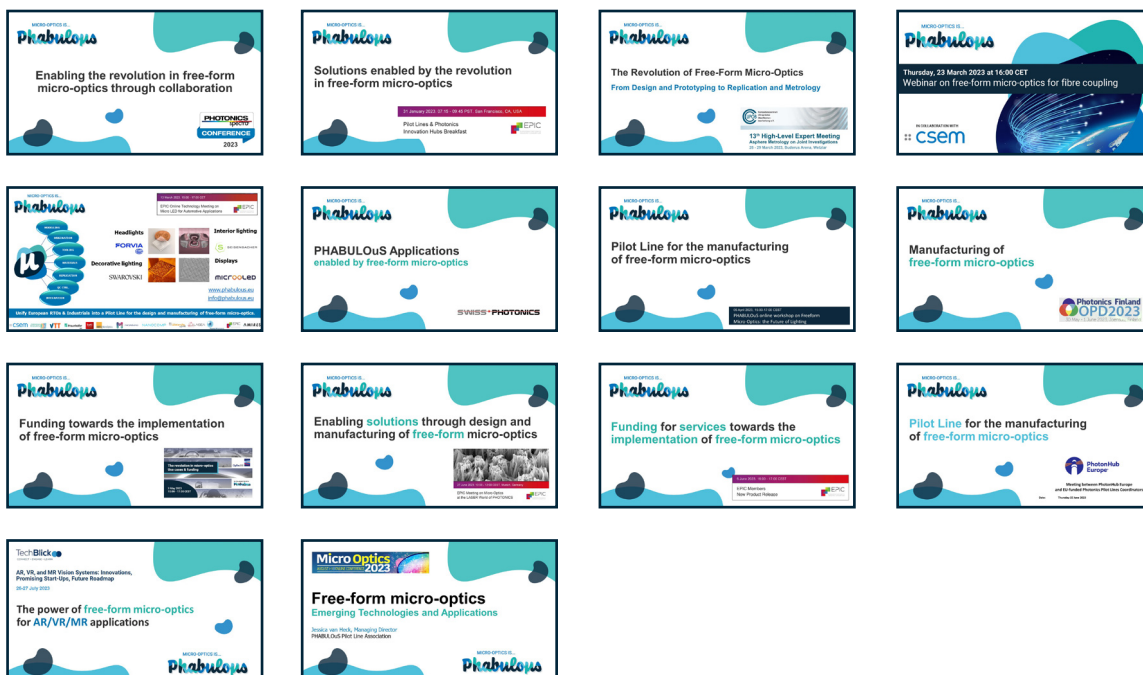
THE FUTURE IS FREE-FORM

Oulu Area:	Mon	16/01/2023
Joensuu Area:	Tue	17/01/2023
Tampere Area:	Wed	18/01/2023
Helsinki Area:	Thu	19/01/2023
	Fri	20/01/2023

Leave your details to find out more

In collaboration with PHABULOUS Partners: **NANOCOMP & VTT**

In total, 10 presentations were given by the PLFO at different conferences and events and also a first online event was organized by the PLFO in preparation of its sustainability.



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OUR MEMBERS



MORPHOTONICS



PowerPhotonic



Funded by



PHOTONICS PUBLIC PRIVATE PARTNERSHIP

The PHABULOuS Pilot Line Association was founded as part of the PHABULOuS project through funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 871710 as an EC funded initiative, in a public-private partnership with Photonics21. www.photonics21.org