INNOVATION AWARD LASER TECHNOLOGY

Finalists 2026

INNOVATION AWARD LASER TECHNOLOGY 2026

Dear participants of the ceremony,

What drives people to innovative excellence in our institutions and companies? Is it the desire to solve a given task as optimally as possible using the latest technology? The inherent power of the engineer to constantly improve the status quo? Internal corporate goals? External competition? Is it the conviction of providing people with better living conditions thanks to innovative developments? Or is it the pure ambition of many technology experts? Probably, there is a little of everything.

Innovators are usually self-motivated and exceptionally effective people who use their creativity, skills and will to transform new ideas into concrete products, tools, processes and services. And yet, in highly advanced fields such as laser technology, the expertise and the equipment of a single expert rarely suffices to convert an idea into practice.

More often, through the interaction of several experts in a well-coordinated team, do relevant developments occur. When the invention is rewarded because the market responds positively, the innovation has succeeded.

By bestowing the Innovation Award Laser Technology, we want to distinguish exactly those innovators who have accompanied an invention from research through development to the market launch within the field of production-oriented laser technology. Thanks to their innovations each of the three finalist teams of the Innovation Award Laser Technology 2026 has contributed to the advancement of science and technology significantly. They deserve our thanks and recognition. Finally, we would like to thank the jury members for their commitment and wish you many inspiring ideas for your own developments.

Ulrich Berners
(President | Arbeitskreis Lasertechnik e.V.)

Dr. Markus Kogel-Hollacher
(Managing Director | Arbeitskreis Lasertechnik e.V.)

AKL
ARBEITSKREIS
LASERTECHNIK e.V.

THE JURY 2026

Dr. Guido Bonati
Sill Optics GmbH, Wendelstein, Germany

Christoph Franz
4D Photonics GmbH, Isernhagen, Germany

Dr. Johanna Helm
FEV Europe GmbH, Aachen, Germany

Dr. Willem Hoving

Eric Mottay
h-nu, Bordeaux, France

Prof. Juan M. Pou Saracho
Universitade de Vigo, Vigo, Spain

Prof. Barbara Previtali
Politecnico di Milano, Milan, Italy

Pablo M. Romero
AIMEN, O Porriño, Spain

Dr. Kira van der Straeten
DVS Technology AG, Dietzenbach, Germany

Dr. Sabrina Vogt, Saint-Gobain Research Germany, Herzogenrath, Germany

Dr. Markus Kogel-Hollacher (no voting rights)
Chairman | Arbeitskreis Lasertechnik e.V.

Prof. Stefan Kaierle (no voting rights)
Chairman | LZH e.V., Hannover, Germany

Katharina Schulte (no voting rights)
Assistant | Arbeitskreis Lasertechnik e.V.

www.innovation-award-laser.org

INNOVATION AWARD LASER TECHNOLOGY 2026

Objectives

The Innovation Award Laser Technology is an European research prize awarded at 2-yearly intervals by the associations Arbeitskreis Lasertechnik e.V.. The award can be conferred on an individual researcher or on an entire project group, whose exceptional skills and dedicated work have led to an outstanding innovation in the field of laser technology. The scientific and technological projects in question must center on the use of laser light in materials processing and the methods of producing such light, and must furthermore be of demonstrable commercial value to industry.

Selection procedure and finalists

A shortlist of best candidates is compiled by an international jury consisting of ten members recruited from industry and the research community. The prize winner, as well as the second and third placed, are then selected as finalists by the jury on the basis of merit. The prizewinner will receive the sum of 10.000 € in recognition of his work and be furthermore awarded the title of "AKL Fellow".

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THE PROJECT

Members of the project team

- Dr. Anne Michel, 4JET microtech GmbH, Alsdorf, DE
- Daniel Bold, 4JET microtech GmbH, Alsdorf, DE
- Maik von Ringleben, 4JET microtech GmbH, Alsdorf, DE
- Mark Houben, 4JET microtech GmbH, Alsdorf, DE
- Dr. Michiel Top, 4JET microtech GmbH, Alsdorf, DE
- Romina Villella, 4JET microtech GmbH, Alsdorf, DE
- Tobias Köhler, 4JET microtech GmbH, Alsdorf, DE
- Vera Petersen-Krauß, 4JET microtech GmbH, Alsdorf, DE

Areas of application

Riblet technology reduces surface drag and offers benefits across multiple industries. Its greatest potential is in aviation, where it can cut fuel consumption by up to 3 %, saving about 2.5 billion USD annually and reducing nearly 10 million tons of CO_2 emissions in long-haul flights. Additional savings are possible in general and military aviation. Beyond aviation, riblets improve wind turbine efficiency, adding an estimated 2.4 billion euros annually, and enhance energy efficiency in maritime transport and high-speed trains.

Technological impact

Traditional riblet products are based on adhesive films applied to aircraft, which add weight and create waste. Our new laser-based process now enables riblet structures to be applied directly to the outer paint layer in one step, using high-power CO_2 laser sources and advanced interference techniques. The method requires no chemicals or consumables and is stable, efficient, and suitable for large-area application.

First dedicated Lab setup in 2021, © 4JET.

Real-scale prototype for the application of Riblets on the wing of a commercial wide-body aircraft, © 4JET.

Members of the team working at the scale-up of the LEAF technology using the Riblator 9000, © 4JET.

1st PRIZE – 4JET MICROTECH

LEAF LASER RIBLETS – SHARK SKIN FOR GREENER AVIATION

Dr. Tobias Dyck, Head of New Business Line LEAF, 4JET microtech GmbH, Alsdorf, DE

Skin friction drag represents approximately half of the total drag experienced by passenger aircraft, significantly contributing to fuel consumption and CO_2 emissions. While maintaining smooth surfaces is one strategy to minimize this drag, the introduction of shark-skin-inspired microtextures known as riblets offers a substantial improvement, with the potential to reduce skin friction drag by up to 10%. Riblet technology has been extensively researched since the 1990s and is now broadly recognized within industry. However, the practical challenge remains in efficiently applying these 100 µm small riblets across the over 1000 m² large aircraft surface.

This is where the innovative Laser Enhanced Air Flow (LEAF) technology provides a breakthrough, enabling the large-scale application of riblets with unmatched precision and efficiency. LEAF technology uses a coherence-optimized, multi-kilowatt CO_2 laser system, that is divided into multiple sub-beams. These sub-beams are reunited at the target surface, generating an interference pattern that enables simultaneous carving of multiple riblets. This process not only outpaces traditional laser ablation methods in terms of speed, but it also expands the depth of field by a factor of 200, reducing the positioning requirements typically associated with laser processing. As a result, LEAF technology can treat large objects fficiently – even in dynamic industrial maintenance settings making it ideally suited for direct fabrication of drag-reducing surfaces on wide-body aircraft, cruise ships, and wind turbine blades.

With process throughputs reaching 1 m² per minute, LEAF technology enables the treatment of the most relevant areas of an aircraft in under 8 hours. This rapid process translates directly into fuel savings of about 1 %, equating to cost reductions of more than $ 1.2 million per aircraft and application. Beyond the impressive financial benefits, the reduction in fuel consumption has the potential to decrease CO_2 emissions across the aviation sector by over 10 million tons each year. The process requires no chemicals or consumables, apart from electricity, making it both environmentally friendly and operationally efficient.

The LEAF technology was developed based on the direct laser interference patterning (DLIP) technology, used to create micrometer and sub-micrometer periodic microstructures for surface functionalization applications. In 2016, the DLIP technology was modified at 4JET using a CO_2 laser source to create microstructures with spacings between 60 and 140 µm, to produce aerodynamically relevant riblets for aviation.

The first work between 2017 and 2020 was focused on the optics and electronics needed to scan, split and recombine the beam. Optical lab setups were engineered, built, and tested to create a robust and reliable system to operate the LEAF technology. The first dedicated lab tool was finished in 2021. The work here focused on understanding the correlation between process parameters and riblet geometry. By 2022, the technique had been successfully demonstrated in the lab on several certified paint systems for aviation. Building on this achievement, the focus shifted toward large-area application, aiming for seamless adoption in real-world operations.

In 2025, the Riblator 9000 marked a major milestone as the first full-scale prototype, proving that riblets can be efficiently and reliably applied directly to the wing of commercial aircraft.

THE PROJECT

Members of the project team

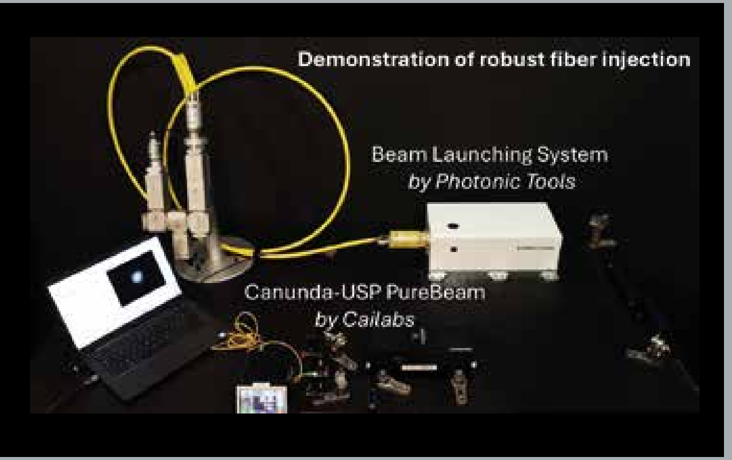
- Dr. Jean-François Morizur, Cailabs, Rennes, FR
- Dr. Clément Jacquard, Cailabs, Rennes, FR
- Dr. Dmitry Nuzhdin, Cailabs, Rennes, FR
- Pierre Sevillano, Cailabs, Rennes, FR
- Adeline Orieux, Cailabs, Rennes, FR
- Dr. Andreas Rudolf, PT Photonic Tools GmbH, Berlin, DE
- Dr. Sebastian Eilzer, PT Photonic Tools GmbH, Berlin, DE
- Paul Froemel, PT Photonic Tools GmbH, Berlin, DE

Areas of application

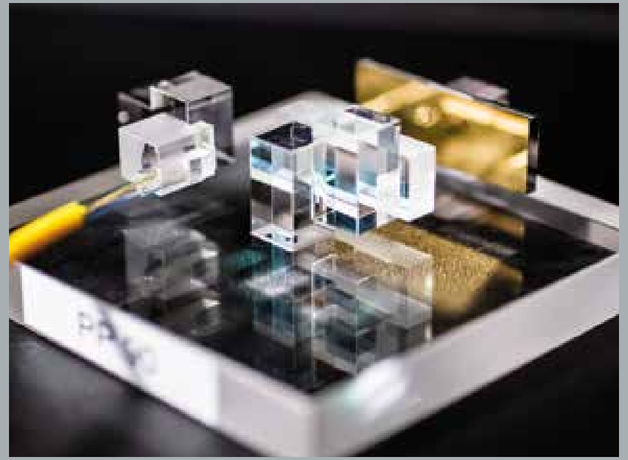
PureBeam enables robust femtosecond fiber delivery for industries where ultrashort-pulse lasers are limited by fragile free-space setups, including semiconductors, electronics, medical devices and aerospace. Reliable hollow-core fiber coupling supports centralized laser architectures, reducing CAPEX and increasing uptime. By making ultrafast fiber delivery scalable, PureBeam enables high-volume production and new industrial manufacturing models..

Technological impact

Based on Multi-Plane Light Conversion (MPLC), PureBeam performs modal analysis of the input beam and delivers passive mode cleaning at the speed of light. By enforcing true 3D stability (position, angle, waist and M²), it secures stable coupling into hollow-core fiber – the only viable path to fiber-delivered USP lasers – removing the risk of fiber damage and the main barrier to industrial adoption. The result: safer operation, higher uptime, simplified architectures and scalable USP manufacturing.



Demonstration of Robust Fiber Injection, © Cailabs, Rennes.



Multi-Plane Light Conversion, © Cailabs, Rennes.

Canunda-USP PureBeam, © Cailabs, Rennes.

2nd PRIZE – CAILABS

BEYOND FREE-SPACE BEAMS: PURE STABILITY AND ROBUST FIBER DELIVERY TO OPEN NEW FRONTIERS FOR ULTRAFAST LASERS

Gwenn Pallier, Product Line Manager, Cailabs, Rennes, FR

Does anyone today deploy a high-power industrial cw laser through a fragile free-space optical chain across a factory floor? Of course not. Once high-power lasers became fiber-delivered, complexity disappeared, uptime improved and scalability became natural. Ultrafast lasers are now standing at that exact turning point.

Ultrashort-pulse (USP) lasers have revolutionized precision manufacturing, enabling micromachining with minimal thermal impact and unmatched accuracy. Yet their large-scale industrialization remains constrained one structural limitation: beam delivery. Most femtosecond systems still rely on free-space propagation between the laser source and the process head. In real factory environments, this means sensitivity to thermal drift, mechanical instability, complex alignment, long commissioning and limited scalability. The industrial consequences are tangible: redundant lasers to secure uptime, higher CAPEX, constrained layouts and cautious deployment across production lines.

The only viable path to industrial fiber delivery of high peak-power femtosecond pulses is hollow-core fiber. Unlike solid-core fibers, hollow-core fibers guide light primarily in air, drastically reducing nonlinear effects and preserving pulse integrity at extreme peak powers. However, coupling into hollow-core fiber is extremely sensitive. Minute variations in beam position, angle, waist location or modal content can destabilize transmission or create localized intensity peaks at the input, introducing a real risk of fiber damage. This sensitivity has become the main barrier to industrial adoption of fiber-delivered USP systems.

CANUNDA-USP PureBeam by Cailabs introduces a fundamentally new approach. Based on Cailabs' proprietary Multi-Plane Light Conversion (MPLC) technology, it does not attempt to chase instabilities with sensors and feedback loops. Instead, it operates directly in the language of spatial modes. Any real industrial beam is a superposition of modes: the desired fundamental TEM00 mode combined with higher-order modes generated by thermal lensing, alignment imperfections, mechanical drift or operating-regime changes.

PureBeam performs a modal analysis of the incoming beam and applies a sequence of precisely engineered phase transformations. Through fully passive mode cleaning, it selectively transmits only the stable TEM00 component while spatially separating and rejecting higher-order modes. This process occurs entirely optically, at the speed of light, with no electronics, no actuators and no reaction time.

The result is true 3D stability: position (x/y), angle (pointing), waist location (z) and beam quality (M²) are inherently stabilized before the beam reaches the fiber input. By enforcing modal purity, PureBeam removes the intensity fluctuations responsible for fiber-threatening hotspots and secures stable hollow-core coupling.

For the first time, ultrafast lasers can be treated as installable industrial utilities. Combined with a dedicated Beam Launching System (BLS), PureBeam enables robust, high-power femtosecond fiber delivery and simplifies machine architectures. It allows centralized, shareable laser sources, reducing CAPEX and improving uptime at factory level. This represents a structural shift rather than an incremental improvement, enabling scalable ultrafast manufacturing, robotic integration and high-volume production. By overcoming beam delivery limitations, PureBeam makes fiber-delivered ultrafast lasers industrially viable and unlocks their full potential for large-scale industrial applications.

THE PROJECT

Members of the project team

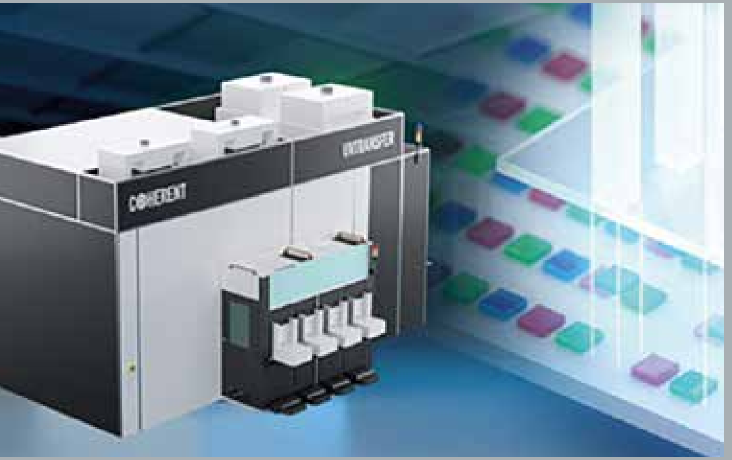
- Ralph Aschenbach, Coherent LaserSystems GmbH & CO. KG, Göttingen, DE
- Gordon Arand, Coherent LaserSystems GmbH & CO. KG, Göttingen, DE
- Andre Sill, Coherent LaserSystems GmbH & CO. KG, Göttingen, DE

Areas of application

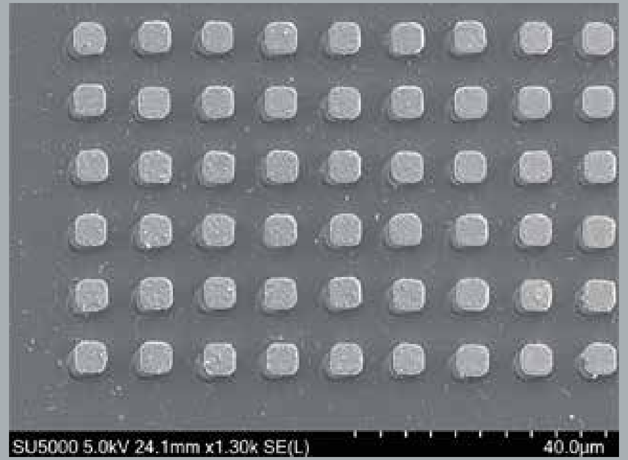
The mass transfer technology is used at worldwide suppliers along the microLED process chain, mainly the display industry. Other markets like the Communication Sector where tiny microLED's or VCSEL could be used for fast efficient data transfer are under discussion. Photonics SME's in Germany and Europe could benefit as well. The transfer technology will be exploited and adapted to other industries e.g. Microelectronics in the future.

Technological impact

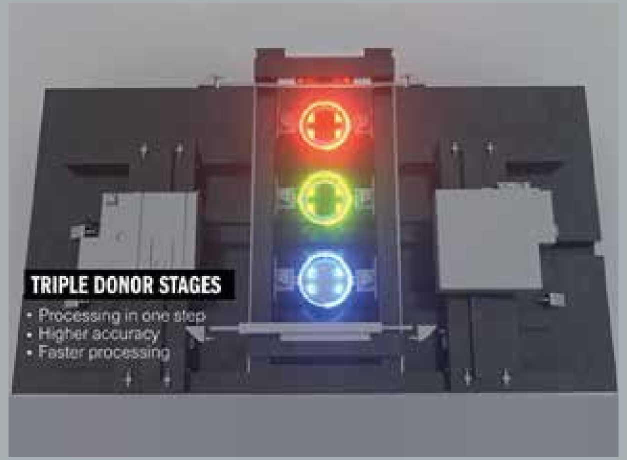
Coherent's mass transfer solution offers a significant contribution to manufacturing cost reduction due to the process parallelization with the capability to use individual process recipes. The concept is based on a high-energy DUV laser, a mask imaging technology, and a efficiency driven system multi-stage approach. The developed digital twin of the fully automated system helps to optimize process strategies which shorten development times and improve the quality of the processed display.



MicroLED Laser Mass Transfer System, © Coherent.



Laser Mass Transfer of 5 µm microLED's by using mask imaging in combination with a high-energy DUV Laser, © Coherent.



Triple Donor Stage to transfer RGB microLED's efficiently by minimizing load/unload and calibration times , © Coherent.

3rd PRIZE – COHERENT

LASER MASS TRANSFER OF MICROLED'S – A BREAKTHROUGH TO COMMERCIALIZATION USING A HOLISTIC SYSTEM APPROACH

Dr. Oliver Haupt, Director Strategic Marketing, Coherent LaserSystems GmbH & CO. KG, Göttingen, DE

Lasers, mainly UV-Lasers, are widely used in today's display manufacturing production lines in Asia. Current technologies like OLED have some limitations in lifetime/durability and sizes which limits the expansion into other markets like large TV´s, cars, etc. Since years, new display technologies are discussed and have entered the market, one of the most promising technologies is microLED displays.

The overall challenge to commercialize microLED displays is the overall costs. Chip sizes must become smaller; defects must be reduced. Today large chip sizes and inhomogeneities resulting in lower yield, inhomogeneous transfer using mechanical stamps and high material costs.

Laser Mass Transfer of microLED's is solving the current bottleneck but only in combination with a holistic solution that combines fast touchless microLED laser transfer, high-precise system architecture, and a comprehensive software package incl. AI functionality to optimize strategies the transfer parameters from wafer to panel. Due to the required material combination, the Gallium Nitride or Aluminum Nitride on an Epiwafer, UV or DUV light is mandatory to avoid any damage of the active material and at the same to providing a higher special resolution compared to longer wavelengths.

Our mass transfer solution eliminates existing disadvantages such as selectivity, mixing, and the inability to transfer the smallest chips. All of this is necessary to massively reduce the cost of microLED displays compared to other technologies. The high UV energy and large laser beam size improves the transfer speed by a factor of 80 compared to pick-and-place. To minimize loading and calibration times, a triple donor stage is offered which can hold 3 wafers in 3 colors to transfer the necessary RGB pixel onto the backplane of the display.

The microLED transfer technology has been used for several years. The new innovative holistic approach was introduced in early 2025, and currently under evaluation at several display makers worldwide.

FORMER FINALISTS

2018 – Laserline GmbH,
© Fraunhofer ILT / Andreas Steindl.

2020 – TRUMPF Werkzeugmaschinen GmbH & Co. KG,
© Arbeitskreis Lasertechnik e.V. / Andreas Steindl.

2022 – PRIMES GmbH,
© Arbeitskreis Lasertechnik e.V. / Andreas Steindl.

2024 – Cleansort GmbH,
© Arbeitskreis Lasertechnik e.V. / Andreas Steindl.

2018

1st Prize
MULTI SPOT MODULES TO IMPROVE JOINING PROCESSES DUE TO TAILORED SPOT GEOMETRIES

Dr. Axel Luft (Team Representative)
Laserline GmbH, Mülheim-Kärlich, Germany

2nd Prize
MULTI PARALLEL ULTRAFAST LASER ABLATION FOR LARGE SCALE ULTRAPRECIOSION MANUFACTURING

Dr. Gerald Jenke (Team Representative)
Saueressig GmbH + Co. KG, Vreden, Germany

3rd Prize
RAIO DSS: A HIGH FLEXIBILITY DYNAMIC BEAM CONTROL SYSTEM FOR LASER HEAT TREATMENT AND RELATED HIGH POWER LASER APPLICATIONS

Alejandro Bárcena (Team Representative)
Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain

2020

1st Prize
ACTIVE SPEED CONTROL – CAMERA-BASED SENSOR SYSTEM FOR CLOSED-LOOP FEED REGULATION IN LASER CUTTING

Dr. Boris Regaard (Team Representative)
TRUMPF Werkzeugmaschinen GmbH & Co. KG, Ditzingen, Germany

2nd Prize
NEW LASER SOLUTION FOR DEFUSING UNEXPLODED (UXO) BY THE USE OF A DISPOSABLE 3D PRINTED TOOL HEAD

Dr. Oliver Meier (Team Representative)
LASER on demand GmbH, Burgdorf, Germany

3rd Prize
UNLIMITED FLEXIBILITY FOR SHORT PULSE LASER APPLICATIONS

Dr. Maik Frede (Team Representative)
neoLASE GmbH, Hannover, Germany

2022

1st Prize
SCANFIELDMONITOR (SFM)

Stefan Wolf (Team Representative)
PRIMES GmbH, Pfungstadt, Germany

2nd Prize
INNOVATIVE SURFACES USING HIGH-SPEED LASER-BIOMIMETICS

Dr. Tim Kunze (Team Representative)
Fusion Bionic GmbH, Dresden, Germany

3rd Prize
FINALLY UNITED: OCT-BASED PROCESS CONTROL AND ON-THE-FLY REMOTE LASER WELDING IN ONE TOOL

Thibault Bautze-Scherff (Team Representative)
Blackbird Robotersysteme GmbH, Garching bei München, Germany

2024

1st Prize
LASER-BASED SORTING SYSTEMS FOR RESOURCE-SAVING RECYCLING OF RECYCLABLE MATERIALS

Edwin Büchter (Team Representative)
cleansort GmbH, Rösrath, Germany

2nd Prize
HOLISTIC APPROACH FOR LASER BEAM WELDING FOR CELL CONTACTING OF BATTERY MODULES WITH HIGHEST QUALITY

Dr. Jan-Philipp Weberpals (Team Representative)
AUDI AG, Neckarsulm, Germany

3rd Prize
CANUNDA – UPSCALING LASER PROCESSING WITH BEAM-SHAPING

Gwenn Pallier (Team Representative)
Cailabs, Rennes, France

ARBEITSKREIS LASEERTECHNIK E.V.

Arbeitskreis Lasertechnik e.V.

Arbeitskreis Lasertechnik e.V. is a registered non-profit association formed in 1990 by a group of companies and private individuals aiming to pool their experience and conduct joint public-relations activities in order to spread the use of laser technology in industry and promote the sharing of scientific ideas. The Innovation Award Laser Technology aims to reward excellent achievements in applied research and outstanding innovation in the field of laser technology and to shine a spotlight on their authors.

In 2026, more than 200 laser experts and enthusiasts were signed up as active members of the AKL network. The association's activities include disseminating information on innovations in laser technology, organizing conferences and seminars, compiling educational material dealing with laser technology, stimulating the interest of future young scientists, and providing advice to industry and research scientists on questions relating to laser technology.

Executive board

- Ulrich Berners (President)
- Dr. Jochen Stollenwerk (Vice President)
- Dr. Claus Schnitzler (Treasurer)
- Dr. Markus Kogel-Hollacher (Managing Director)

For further information please visit:
www.akl-ev.de

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