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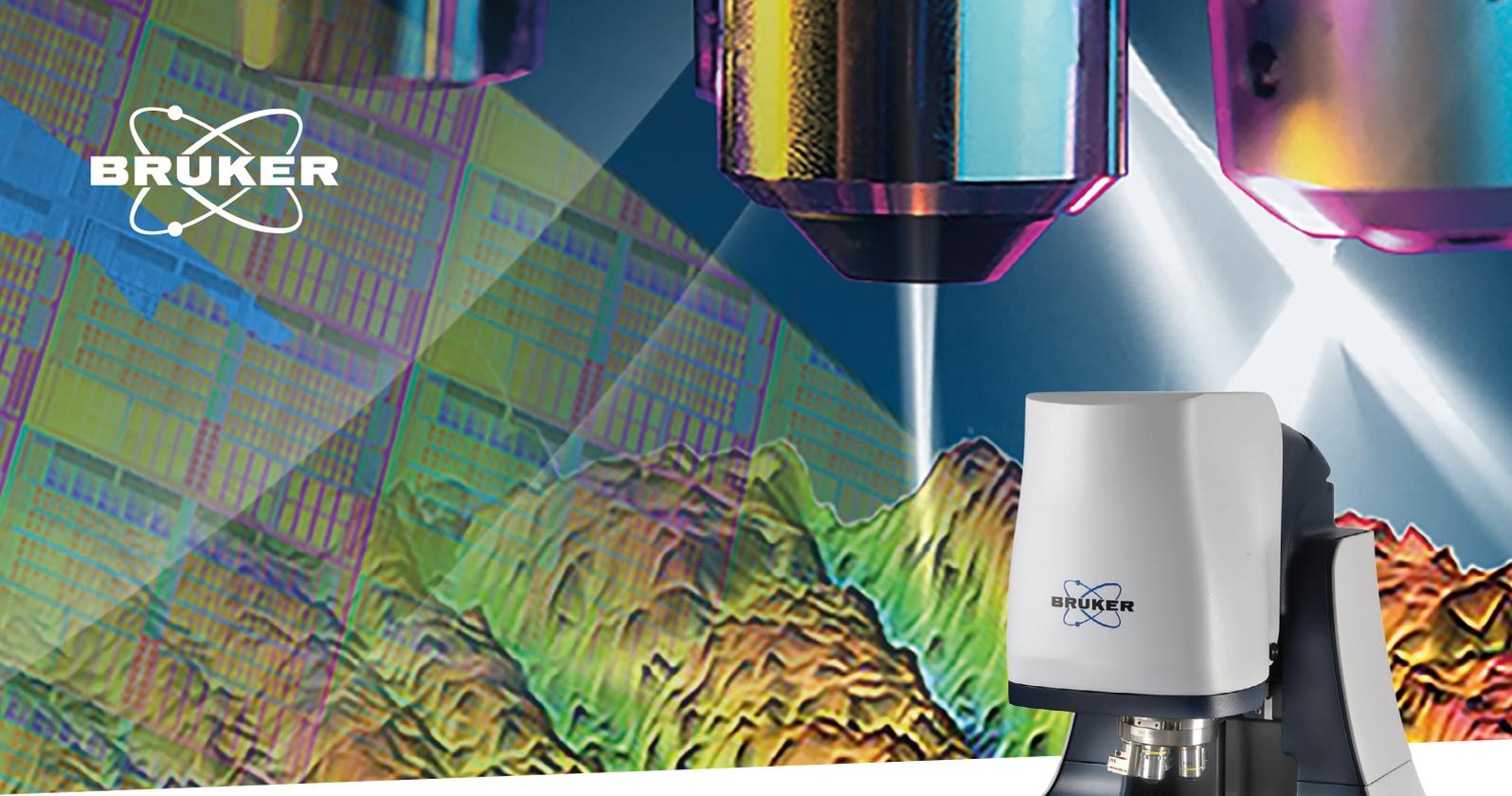
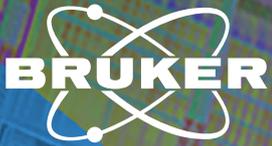
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Innovation with Integrity

# New €100 million Jenoptik fab officially opened in Dresden

“State-of-the-art plant” to manufacture of micro-optics for semiconductor sector.

After two and a half years of construction, the Jenoptik Group has inaugurated its new factory (or “fab”) in Dresden, Germany, which represents the company’s largest single investment in its recent history. By expanding its production and research and development capacities for micro-optics, Jenoptik says it is supporting production technologies with high-precision sensors for high-performance chips, including for applications in AI.

The new fab in Dresden was officially opened on May 6, 2025 in the presence of customers, partners, and representatives from business, politics, including from the Free State of Saxony and the City of Dresden.

Jenoptik President & CEO Dr. Stefan Traeger and Site Manager Dr. Andreas Morak pressed the symbolic start button, which opened the fab accompanied by a short light show. The Jena-based company also invited around 200 employees from its micro-optics business in both Dresden and Jena to a joint employee celebration to mark the opening.

“We are proud that we have completed this largest single investment in the company’s recent history, at just under 100 million euros, on schedule. In a challenging environment with constantly rising prices and scarce resources, this



Opening ceremony in Dresden, from left: Jenoptik Executive Board member Ralf Kuschnerer, Dresden’s Lord Mayor Dirk Hilbert, Minister President of Saxony Michael Kretschmer, Jenoptik CEO Stefan Traeger.

is an outstanding achievement,” said Dr. Traeger.

Saxony’s Minister President Michael Kretschmer said: “The opening of the new Jenoptik factory in Dresden is a strong signal for innovation and cooperation in Silicon Saxony. The fact that the world-renowned Jenoptik Group has now consolidated its production of special micro-optics and sensors for the semiconductor equipment industry here means additional positive effects in terms of employment and value creation.”

## ‘Demanding manufacturing environment’

The new high-tech fab now employs almost 100 people in what is described

as “a demanding manufacturing environment”. Production takes place in ISO 5 and ISO 3 clean rooms, which meet the highest requirements for vibration-free operation and temperature stability.

The locations previously distributed across the City of Dresden are now united

under one roof, the company stated. The new location offers significantly expanded production capacities for technologically-sophisticated micro-optics and sensors. These are mainly used in systems for semiconductor lithography and inspection, but also in systems for laser material processing, for example.

## Photonics as growth driver

The semiconductor equipment industry is the most important area of application for the micro-optics manufactured at the Dresden site. Micro-optical sensors enable, for example, the precise positioning of wafers during lithographic processes in chip manufacturing. Areas of application include both deep and extreme ultraviolet (DUV, EUV) lithography.

The firm has been active in Dresden since 2007. In addition to Dresden, Jenoptik also manufactures its high-precision and micro-optics at its sites in Jena and Triptis (polymer optics) in Thuringia, in Heerbrugg, Switzerland, and in Jupiter (Florida) and Huntsville (Alabama), USA. The Group employs around 4,600 people worldwide.



Now open: Jenoptik’s new fab in Dresden, Germany.

<https://optics.org/news/16/5/15>

# IPG outlook dimmed by potential \$15M tariff delay

Fiber laser firm's stock drops 13% as industrial woes continue; CEO cites traction in medical and micromachining applications.

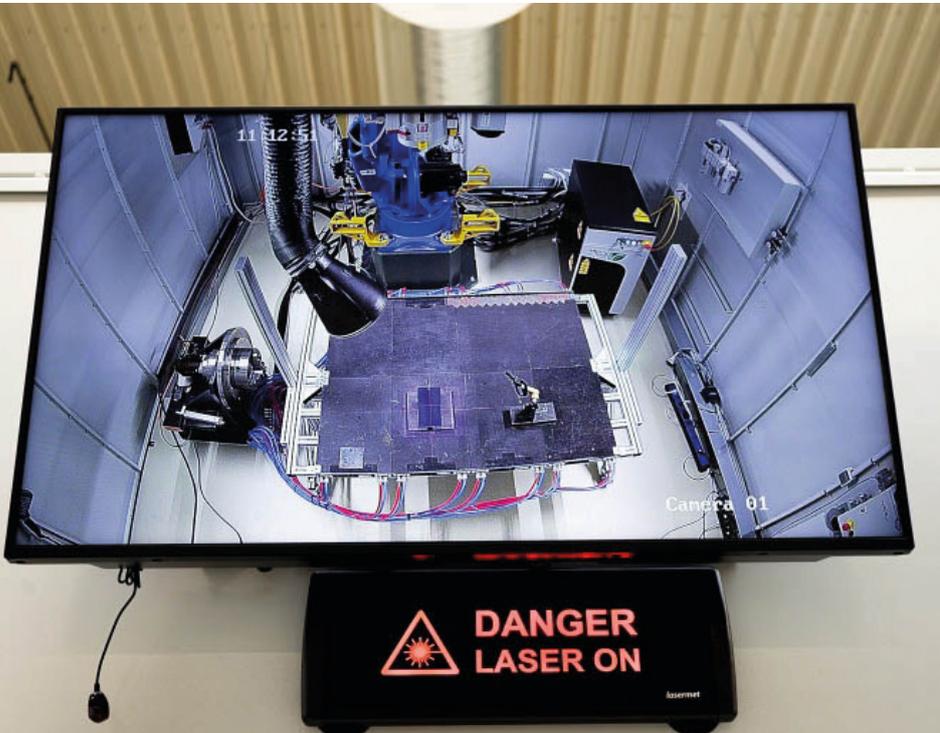


Photo: AkzoNobel Coatings.

*A new partnership between IPG Photonics and paint giant AkzoNobel will see direct diode lasers used instead of large ovens to cure powder coatings - meaning a faster process and less wasted energy, according to the two partners.*

IPG Photonics, the US-headquartered fiber laser vendor, has reported sales revenues of just under \$228 million for the opening quarter of 2025 - down 10 per cent on the same period last year.

Stemming from continued weakness in the market for laser welding and cutting applications, traditionally IPG's key areas, that drop in sales saw the firm's operating income fall from \$19.1 million a year ago to just \$1.8 million in the latest three months.

And although CEO Mark Gitin said that there were now signs of stabilization in laser welding, and a "modest uptick" in other areas, the firm's immediate outlook has been further clouded by continued uncertainty over new US import tariffs.

## \$15M delayed shipments

Based on IPG's current understanding of how those tariffs and retaliatory actions are being implemented, the company's

June quarter sales are expected to be in the region of \$225 million - about \$15 million lower than would otherwise have been the case.

"The guidance reflects approximately \$15 million in potential shipment delays to customers," Gitin told an investor conference call discussing the latest results. "These are not cancellations; we will fulfill these orders as we optimize production across our global footprint."

IPG is adapting its manufacturing operations, which are located in the US, Germany, Italy, and Poland, and their respective supply chains, to minimize the impact of the new tariffs, with the CEO pointing out:

"We've demonstrated this agility before - most notably when we successfully navigated the loss of access to our Russian operations following the invasion of Ukraine.

"Looking ahead, our strong manufacturing base in North America positions us well, especially as reshoring drives renewed investment in local, automated industrial production."

And while China remains a hugely important market for IPG, accounting for nearly a quarter of total sales in 2024 and a slightly higher proportion in the opening quarter of 2025, IPG's CFO Tim Mammen pointed out that about 80 per cent of what the company produces for China is already made outside of the US.

Specific products that IPG does ship from the US to China will now be manufactured at other company locations, with the potential \$15 million in delayed sales revenues from the current quarter expected to be recouped in the following three months.

Mammen also stressed that the tariff impact for IPG was calculated from the current rates being applied, and not from the original "Liberation Day" announcement of much higher rates in early April, which would imply much more significant disruption if enacted.

## AkzoNobel powder coatings

Gitin told investors that he was encouraged by the momentum now building across applications outside of the workhorse industrial areas of cutting and welding, noting progress in urology, micromachining, and laser curing of powder coatings.

For urology, IPG is currently developing a new thulium laser that is set to launch later this year and expected to contribute significant sales from 2026. As well as working with key player Olympus, IPG has recently signed up another customer for what is said to be a multi-billion-dollar market.

"We also launched a new product in micromachining and secured new business that nearly doubled our revenue in that area this quarter," added the CEO.

Meanwhile a "groundbreaking" new powder coating application involves global paint giant AkzoNobel, and is set to offer a faster and more energy efficient

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## IPG outlook dimmed by potential \$15M tariff delay

alternative to conventional curing methods using ovens. IPG and AkzoNobel have signed an

agreement for the partnership to exclusively serve customers in the Europe, Middle East and Africa region, using lasers to selectively heat the applied powder coating inside an otherwise cold oven.

"It means no heat escapes onto the factory floor and no energy is wasted heating the atmosphere or the curing enclosure," announced the paint company.

"High-intensity laser heating also enables curing times to be reduced to just a

few minutes, compared with the 15-20 minutes that's currently required using traditional curing methods. The IPG Photonics process also enables curing to occur in less than half the space required by a traditional oven."

Jorrit van Rijn, the global marketing director for AkzoNobel's powder coatings business, added: "This is a hugely exciting partnership which has the potential to offer customers game-changing benefits in terms of process speed, efficiency and energy savings."

- Immediately following IPG's latest financial update (on 06 May, 2025), the firm's Nasdaq-listed stock price dropped in value, ending the trading day 13 per cent down.

Closing at just under \$55 on May 6, the stock is down 25 per cent since the start of 2025, and around 80 per cent lower than the all-time high of just over \$250 achieved in 2021.



Image: Yahoo! Finance.

The stock price of fiber laser firm IPG Photonics has dropped in value by around 80% since reaching an all-time high of around \$250 in mid-2021.

<https://optics.org/news/16/5/8>

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# Coherent sales hit new high as CEO points to supply-chain resilience

Shipments for AI data center and telecoms applications continue to grow quickly despite macroeconomic tension.

Diversified laser and photonic component manufacturer Coherent has posted record-breaking sales of just under \$1.5 billion for its latest financial quarter, up 24 per cent year-on-year as demand related to artificial intelligence (AI) data centers shows no sign of slowing down.

That is despite what CEO Jim Anderson described as a high level of macroeconomic uncertainty resulting from new US import tariffs.

And although that uncertainty could impact demand for the US firm's industrial lasers, Anderson said that Coherent's sprawling global manufacturing footprint gave it a resilience and adaptability that would minimize any direct tariff effects.

"Our geographically diverse supply chain, combined with the internal production of many of our most critical technologies, provides adaptability and optionality that benefits our customers," he told an investor conference call discussing the latest results.

With 60 production facilities spread across 14 different countries - and around half of those facilities located in the US - Anderson said that Coherent could adapt as necessary to the evolving tariff landscape.

## 1.6T transceiver ramp

The CEO highlighted the large number of new products unveiled by Coherent over the past couple of months, most of which related to AI and telecom developments at the recent Optical Fiber Communications (OFC) event in San Francisco.

Among several new launches were Coherent's options for new 1.6 Tb/s optical transceivers, with the company developing three different technological approaches based around externally modulated lasers (EMLs), vertical cavity surface-emitting lasers (VCSELs), and silicon photonics.

Those transceivers are expected to go into

Anderson highlighted recent efforts to streamline that part of the company's portfolio, by focusing on substrate and epitaxy rather than devices and modules, while the firm is also looking to sell the former EpiWorks wafer foundry in Champaign, Illinois, that was acquired nearly a decade ago as part of a wider effort to expand VCSEL production.

The sales increase and streamlining efforts saw Coherent swing to a pre-tax profit of \$9.9

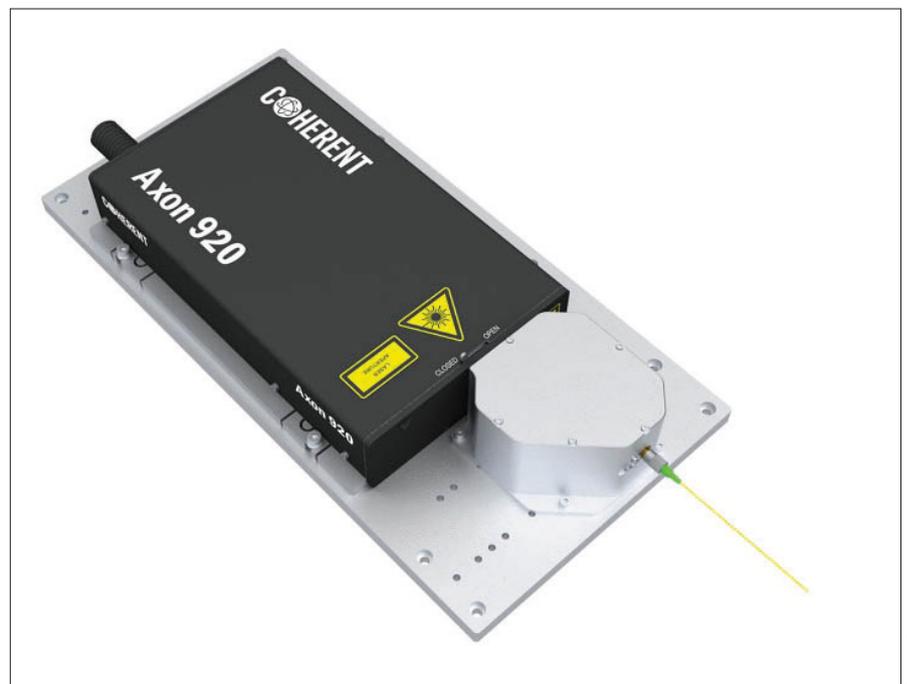


Photo: Coherent.

While most of Coherent's financial performance now relates to demand from data centers, the company remains a key supplier of state-of-the-art lasers used in research laboratories. One of the firm's latest products is the "Axon FL", a fiber coupling module that transforms the Axon 920 TPC ultrafast femtosecond laser into a plug-and-play solution for cutting-edge microscopy applications in optogenetics and cellular dynamics.

commercial production later this year, with an extended ramp into 2026.

The next step on the optical transceiver roadmap will be 3.2 Tb/s speeds, and with this in mind Anderson also picked out the firm's work on 400 Gb/s EMLs, seen as the "foundation stone" for that technology.

Demand for current technologies saw Coherent's networking division post sales of \$897 million in the three months ending March 31, up 45 per cent year-on-year.

For the company's industrial division, where demand for excimer lasers used for annealing applications in organic LED (OLED) display production is said to be strong, sales of \$364 million rose at a steadier rate of 4 per cent.

## Illinois fab sale

Coherent's materials division, which largely relates to silicon carbide electronics, posted a slight decline in sales revenues, to \$237 million.

million in the latest quarter, compared with a pre-tax loss of \$31.9 million in the same quarter last year.

Looking ahead, and with the tariff-related uncertainty in mind, Coherent's executive team said that they were expecting sales in the June quarter to be flat sequentially, coming in somewhere between \$1.425 billion and \$1.575 billion.

- Investors appeared to react positively to that outlook and the wider commentary (on 07 May, 2025), with Coherent's stock price rising in value by around 5 per cent on the Nasdaq in pre-market trading following the update.

At just over \$73, the firm's stock price is still down more than 25 per cent since the start of 2025, and currently corresponds to a market capitalization in the region of \$11 billion.

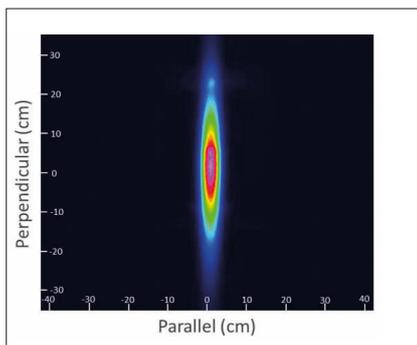
<https://optics.org/news/16/5/13>

# BluGlass demonstrates 'record' single-mode GaN laser

1250 mW of single-spatial mode power from a chip is highest output from one emitter, says Sydney firm.

BluGlass, a Sydney, Australia-based developer of visible wavelength lasers for the quantum, defence, and biotech markets, has demonstrated what it calls "world-record performance" of its single-mode gallium nitride (GaN) lasers, achieving 1250 mW of power from a single laser chip, while maintaining single-spatial mode.

The company stated, "This is the highest known published result available, both commercially and in academia, based on literature searches conducted by the University California, Santa Barbara and BluGlass."



A 67% improvement from the previously reported 750 mW SM performance.

This performance was enabled by combining a blue (450 nm) single-mode laser master oscillator with an integrated power amplifier in a single monolithic chip (SM-MOPA). The performance enhances BluGlass's previously-reported 750 mW single-mode performance by more than 67%, as published at Photonics West in January 2025.

## Multiple potential applications

BluGlass's high-power single-mode MOPA combines the benefits of a single-mode laser, and small form factor advantages for high-precision applications in defense and aviation, quantum sensing and navigation, space and satellite communications, and underwater lidar.

CEO Jim Haden said, "Most high-powered visible lasers sacrifice beam quality and precision to achieve more power in larger form factors. Our advanced integration capabilities will enable industry to pioneer innovations by increasing power without

sacrificing precision and beam stability. We achieved these world-leading results by combining our blue single-mode laser with a power amplifier that boosts the laser's power with minimal beam distortion or increase in noise.

"Single-mode GaN lasers are highly sought after for their high-precision and high-fidelity, despite being challenging to manufacture at high powers. The advantage of the monolithic chip design is significant, in that we can manufacture high-fidelity power and performance at the wafer level, drastically improving size, weight and cost for defence applications, and eliminating several downstream packaging steps," he said.

BluGlass's announcement added that it has now more than quadrupled the power output of its distributed feedback (DFB) family of devices from the 100 mW range to 450 mW, since its Photonics West paper, published in January. The 450mW DFB performance while maintaining near single-frequency output and high side-mode suppression for enhanced signal-to-noise ratio, was achieved by combining a blue (450nm) single-mode DFB laser with an integrated master oscillator power amplifier, in a single monolithic chip (DFB-MOPA).

The company's GaN DFBs are being designed for wafer-scale fabrication to reduce downstream optical complexity and cost, at the same time as addressing critical challenges in quantum technologies and computing while enabling greater production volume and smaller device sizes.

Haden added, "Our strategic focus on scaling power at high fidelity for the precision market that led to this world-record single mode visible power and the quadrupling of power in our narrow linewidth lasers is a direct response to market demand. Our ability to satisfy unmet market needs is why BluGlass continues to be selected as partner of choice by industry leaders, including the US Department of Defense's Microelectronics Commons."

<https://optics.org/news/16/3/21>

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# EU investing €6 million in new optical networks to support future factories

SPRINTER project to develop wireless technology to replace “sluggish” industrial nets.



Photo: SPRINTER.

A SPRINTER team presented the consortium's latest module at OFC 2025. Pictured are Johan (imec), Sadoon (LionIX), David (HHL), Roelof (JC Brits), and Milan Milosevic from PHIX, representatives of the many parties contributing to the project.

A new project is developing an ultra-fast, energy-efficient industrial internet using light-speed lasers and next-generation flexible and adaptable wireless to power future smart factories.

The SPRINTER project, which is supported by European platform Photonics21, is aiming to power the digital backbone of modern industry by enabling ultra-connected smart factories, based on fast-switching optical networks.

With a €6 million investment from the European Commission, the SPRINTER project is developing new optical and wireless technology to “replace today’s sluggish, power-hungry industrial networks with super-fast, laser-driven communications systems — all built for the chaos of the factory floor,” according to Photonics21’s recent launch announcement.

The Photonics21 release states: “At present, factories and industrial sites rely on a mixture of copper cables, unreliable

Wi-Fi, and switching systems. For the real-time, AI-driven future factories and warehouses that deploy automated robots, sensors, machine learning, and 5G-controlled systems, existing setups are too slow and power-hungry.”

But, relying on its expertise in high-speed networks, the SPRINTER team

is said to be redesigning the “nervous system” of modern industry. At the heart of the initiative are high-speed optical transceivers, which will transmit data through fiber cables at up to 200 gigabits per second.

“Industry 5.0 demands faster, smarter, and more robust networks,” said Efsthios Andrianopoulos, a researcher on the Institute of Communication and Computer Systems (ICCS) team that leads SPRINTER. “Our goal is to make Europe the world leader in industrial photonics — providing the tools to support the next generation of automation, robotics and intelligent systems.”

## SPRINTER consortium

The project is creating a dependable wireless communication network that continues to operate seamlessly in harsh, dynamic and extremely complicated environments. The new SPRINTER photonic/wireless hybrid transceivers are being developed to switch from light to millimeter-wave radio signals in order to offer more flexibility and backup, ensuring immunity against any interference.

“Factories are full of moving parts, dust, and interference — a nightmare for traditional WiFi. That’s why we are developing hybrid free-space optical and millimeter-wave transceivers that combine laser and radio technologies to maintain wireless connections, even in the noisiest settings,” said Andrianopoulos.

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SPRINTER brings together leading research centres and industry experts from across Europe.

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## EU investing €6 million in new optical networks to support future factories

"We are building a unified network platform that supports time-sensitive networking systems where delays of even milliseconds can mean the difference between smooth automation and a factory shutdown," said Andrianopoulos.

### Four prototypes

As part of its mission to transform industrial connectivity, SPRINTER is developing four advanced prototypes tailored to the demands of next-generation smart factories. As well as the ultra-fast 200 Gbit/s optical transceivers for high-capacity core networks and hybrid free-space optical and

millimeterwave transceivers, SPRINTER is developing wavelength-tuneable 10 Gbit/s transceivers that can dynamically adapt to changing conditions in real-time.

To boost flexibility and efficiency, the project is also building a new Reconfigurable Optical Add-Drop Multiplexer (ROADM) optimised for space-division multiplexing, enabling intelligent data routing across complex networks to vastly increase the reliability and robustness of existing infrastructure. Funded through the EU's Horizon Europe programme, SPRINTER brings together leading research centres and industry experts from across the continent, including specialists in photonics, telecommunications, and industrial automation.

Led by the Institute of Communication and Computer Systems (ICCS) in Athens, the SPRINTER project brings together 11 partners from across Europe and one from Israel, combining top research institutes with major industry players.



Video explainer

Key contributors include Fraunhofer (Germany), IMEC (Belgium), Lionix International (Netherlands), and Universidad Carlos III de Madrid (Spain), alongside global tech firms like Ericsson (Italy) and Mellanox Technologies (Israel). SMEs such as PHIX, CUMUCORE, and FILL GmbH add specialized expertise in photonic packaging, 5G networking, and smart manufacturing. Swiss partner CSEM also supports the project, contributing expertise in microtechnology and system integration.

<https://optics.org/news/16/4/41>

Sponsored Editorial

## In-line multimode fiber speckle homogenizer

Achieves unmatched illumination uniformity in multimode fiber systems.

In optical systems where performance and precision are paramount, managing and mitigating modal noise in multimode fiber-coupled applications is a longstanding challenge. The In-Line Multimode Fiber Speckle Homogenizer is designed to address this exact issue, delivering a practical and highly effective solution that enhances illumination consistency, improves image quality, and ensures reliable performance across a wide range of demanding optical applications.

Modal noise arises from interference among the multiple propagation paths, or modes, within a multimode fiber. These interference patterns manifest as speckle—a granular noise pattern that can severely degrade optical uniformity and limit system performance. Speckle noise

is problematic in imaging systems, where it compromises resolution, contrast, and signal stability. Traditional methods for reducing speckle, such as moving diffusers or complex optical components, can be bulky and inefficient for integration into compact, fiber-based systems.

The In-Line Multimode Fiber Speckle Homogenizer offers a clean, efficient, and compact in-line solution with greater than 90% speckle contrast reduction at imaging frequencies of 100 Hz, ensuring smoother, more uniform illumination at the output. This performance makes it ideal for high-resolution systems, where stable and consistent light delivery is critical.

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# Lumentum confident of sales ramp as cloud and AI demand strengthen

Photonic component and industrial laser company sees quarterly revenues rising to \$500M by the end of 2025.

Lumentum, the California-headquartered manufacturer of photonic components and industrial lasers, has posted sales revenues of \$425.2 million for the opening three months of 2025 - up 16 per cent year-on-year and just beating its forecast from February.

The San Jose firm is busy ramping production across several of its product lines used in cloud and artificial intelligence (AI) networking applications, with new CEO Michael Hurlston confident that quarterly sales will surpass \$500 million by the end of this year.

"In my first 90 days as CEO, it's become clear that Lumentum is uniquely positioned to lead as the convergence of optics and electronics accelerates AI data center scaling," he said.

"Our innovations - from advanced EMLs [externally modulated lasers] to ultra-high-power lasers - are driving transformative power efficiencies across cloud, AI, and long-haul networks, making us an essential partner in this next era of connectivity."

## \$750M pathway

Appointed in February, Hurlston told an investor conference call discussing the latest results that the firm was "on the right path" to meet that \$500 million milestone, and that with key markets currently growing at annual rates in excess of 25 per cent there was a pathway to reach quarterly sales of \$750 million in the medium term.

With Lumentum's components embedded across the communications ecosystem, and found inside both its own products and those of competitors, Hurlston said that the company was well positioned to benefit from demand driven by cloud computing and hyperscale data center operators, and in spite of wider macroeconomic and geopolitical concerns.

"Markets are growing at unprecedented rates because of the convergence of optics



Image: Lumentum.

While Lumentum's business is now largely driven by optical connectivity applications in data centers and cloud computing, the US company has also reported strong recent demand for ultrafast pulse lasers used in solar cell production.

and electronics," he said. "The opportunity ahead is significant, our components business is performing extremely well, and our wafer fabrication facility expansion remains on track."

As well as its expertise fabricating indium phosphide lasers and photodiodes, as well as vertical cavity surface-emitting lasers (VCSELs), optical transceivers and various other optical networking products, Hurlston highlighted new 1310 nm lasers for co-packaged optics that should start delivering additional sales revenues next year as customers look to improve power efficiencies in data center architectures.

## Industrial research cut

While revenues are on the up, Lumentum's latest figures showed that the firm was not quite yet back to full profitability, although its operating loss of \$38 million was much-improved from the figure of \$115 million a year ago.

Hurlston told investors that he was focused on further improving margins, partly through actions taken to reduce costs within the company's industrial technology business unit.

That business unit, which includes industrial lasers and 3D sensing products, delivered sales revenues of \$60 million in the latest quarter, up 14 per cent year-on-year and partly the result of strong demand for ultrafast lasers now being used in solar cell production.

And while Hurlston pointed out that the company was continuing to explore other

industrial laser applications in display and next-generation semiconductor manufacturing, the company has recently shuttered two research and development sites and three research programs in a bid to improve profit margins.

Looking ahead, the Lumentum executive team is expecting sales in the June quarter to rise to somewhere between \$440 million and \$470 million. That would represent a sequential jump of as much as 10 per cent, largely driven by a ramp in production of optical transceivers now under way in Thailand.

- The latest outlook appeared to please investors, with the company's Nasdaq-listed stock price rising in value by around 7 per cent in after-hours trading following the investor call.

At \$69, the stock price is still down more than 20 per cent from the start of the year on fears about the wider economic impact of US import tariffs, although Lumentum has indicated previously that it expects any direct impact on its business to be minimal.

<https://optics.org/news/16/5/9>

Sponsored Editorial



**HAMAMATSU**  
PHOTON IS OUR BUSINESS

## Illuminating the Future: Hamamatsu Photonics at Laser World of Photonics 2025

At the forefront of photonics innovation, Hamamatsu Photonics is set to make a significant impact at the upcoming Laser World of Photonics 2025 in Munich. Renowned for its comprehensive portfolio of optical sensors, light sources, and imaging systems, Hamamatsu continues to push the boundaries of what's possible in photonics technology.

### Innovations on Display at Laser World of Photonics 2025

Visitors to our booth at Laser World of Photonics 2025 can expect to witness the unveiling of exciting new technologies. Among the highlights are developments in spectrometers, image sensors, photodiodes, and laser-driven light sources. These advancements are designed to meet

the evolving needs of industries ranging from semiconductor manufacturing to quantum research.

Our photonic modules are designed to deliver high performance in compact forms. Their integration into systems facilitates progress in medical imaging, environmental sensing, and industrial inspection.

### Customization: Tailoring Solutions to Specific Needs

Recognizing that off-the-shelf solutions may not always meet specific requirements, Hamamatsu offers customized modules that integrate sensors with optics, circuitry, and software. This approach not only enhances product quality but also accelerates development timelines.

By leveraging their expertise in sensor technology and analog/digital integration, we provide tailored solutions that address unique challenges across various applications.

As part of our commitment to accelerating photonics innovation, we offer a pilot line service, a critical bridge between R&D and full-scale production. This service is designed for customers who need to validate and refine new photonic solutions before moving into high-volume manufacturing. By providing early-stage prototyping, engineering support, and small-batch production capabilities, we ensure that emerging technologies can be rapidly and reliably brought to market. This is particularly valuable for startups and OEMs in dynamic markets where time-to-market is crucial.

### Exploring New Frontiers: Quantum Technologies

Beyond traditional applications, Hamamatsu is making significant strides in quantum technologies. Their development of optically pumped magnetometers (OPMs), based on vapor cell technology, exemplifies their commitment to advancing quantum sensing. These compact OPMs offer high magnetic field sensitivity, making them suitable for biomedical imaging applications like magnetoencephalography (MEG). Collaborations with startups, such as Cerca Magnetics, further underscore the role in pioneering quantum innovations.

### Engaging with the Photonics Community

In addition to showcasing products, Hamamatsu actively engages with the photonics community through initiatives like the Photronics Innovation Awards 2025. This program aims to recognize and support groundbreaking advancements in photonics, offering winners financial support and collaboration opportunities to bring their innovations to market.

[www.hamamatsu.com](http://www.hamamatsu.com)

# ASML maintains growth outlook despite tariff uncertainty

**Lynchpin semiconductor equipment supplier does not yet know how to quantify the impact of US import tariffs and retaliation.**

ASML, the world's dominant supplier of semiconductor lithography systems and a key player in the technology economy, says it is too early to quantify the impact that US import tariffs will have on its business either this year or in the longer term.

Announcing the Netherlands-headquartered firm's latest quarterly results, CEO Christophe Fouquet and his executive team said that based on customer conversations they still expected 2025 and 2026 to be growth years.

But in an in-house video interview

Fouquet and CFO Roger Dassen added that the current "dynamic" situation made it impossible to quantify either the specific impact that US tariffs, retaliatory actions, and potential exemptions might have on ASML's activities, or their effect on the overall market.

Dassen also noted: "We're very actively working with the entire ecosystem to try and minimize the overall impact on the whole ecosystem as a result of that, once we have a better understanding of how exactly it all works."

## Tariff breakdown

The CFO highlighted four different ways

that tariffs could affect ASML's business, on top of any overall impact on global GDP and market confidence leading to lower demand for semiconductor chips and electronic devices.

The most obvious direct impact for ASML would be any tariffs imposed on shipments of new lithography systems to chip manufacturers in the US. Second would be tariffs imposed on parts and tools used for field operations in the US.

A third category could include tariffs on parts imported into the US, one potential example being the high-power carbon dioxide lasers produced by Germany-based Trumpf that are used to produce the extreme ultraviolet (EUV) light used to pattern state-of-the-art chips. These lasers are integrated into full EUV sources at ASML's facility near San Diego, California.

The fourth tariff impact would come from retaliatory actions, where any other country decides to impose tariff charges on products being imported from the US. But right now, Dassen indicated, it

*continued on next page*



Photo: ASML

*ASML's business is a lynchpin within the semiconductor industry - no other company is able to provide the extreme ultraviolet (EUV) lithography systems that enable chip manufacturers to fabricate the most cutting-edge devices needed for AI and other critical applications. The equipment also relies on a highly complex and global supply chain involving hundreds of companies. While the new US administration wants to attract chip producers back to the US, their threatened tariffs would add significant costs to any customers importing such systems, which already cost hundreds of millions of dollars to buy, into the country.*

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## ASML maintains growth outlook despite tariff uncertainty

is impossible to put a number on any of those individual impacts, or the overall effect on system demand.

“Our conversations so far with customers support our expectation that 2025 and 2026 will be growth years,” reiterated Fouquet. “However, the recent tariff announcements have increased uncertainty in the macro environment and the situation will remain dynamic for a while.”

Asked during an investor call to comment on the apparent contradiction between a desire to re-shore chip manufacturing to the US while simultaneously imposing significant tariffs on key chip-manufacturing equipment only available abroad, Dassen responded:

“We understand those comments, [and] that might be the reason why we have seen exemptions on certain products, and the US administration has said it is reviewing everything. The complexity is being recognized by the US administration, and this is why they’ve said that they need more time to work it out.”

### 2025 targets intact

As far as the opening quarter of 2025 was concerned, business went pretty much according to plan, with ASML posting sales of €7.7 billion and a slightly higher profit margin than anticipated thanks to the shipment of more high-end EUV tools, where ASML enjoys a monopoly position. Net bookings of €3.9 billion were also up on last year’s figure of €3.6 billion for the first three months of the calendar year.

For the June quarter, the ASML team says sales should end up somewhere between €7.2 billion and €7.7 billion, with profitability in a broader range than is normal because of the current tariff

uncertainty.

And for 2025 overall, Fouquet and his colleagues are maintaining their prior expectations that sales revenues will end up somewhere between €30 billion and €35 billion, subject to the same uncertainty caveats.

“AI has been very strong and has driven the industry in the last few quarters,” added Fouquet. “We still see a lot of strength in AI. In fact some of the demand for this year, [and] also for next year, has solidified. So that’s very encouraging. If we add to that the discussion with our customers it points to 2025 and 2026 both [being] growth year[s].”

### High-NA EUV progress

One notable development in the latest quarter was ASML’s shipment of a fifth EUV system featuring high numerical aperture (high-NA) reflective optics made by key partner Zeiss, meaning that three customers now have those cutting-edge tools either installed or under installation.

Fouquet also highlighted results from exposures made with those new tools revealed during February’s SPIE Advanced Lithography + Patterning event that took place in San Jose, California, and where Fouquet himself was a plenary speaker.

“I think SPIE was a very good event because we saw our customers being very eager to share their results on high-NA,” said the CEO, noting examples including Intel’s exposure of more than 30,000

wafers on their tool.

“They also pointed very strongly to the fact that high-NA could help them simplify their process,” he added. “They mentioned one layer where they could reduce the number of process steps from 40 to 10. Which of course helps with cycle time, yield, and process complexity.”

Another SPIE presentation, this time from Samsung, suggested that the high-NA tool could reduce their cycle time by 60 per cent.

“We start to see some of the value of high-NA being recognized,” Fouquet added. “Being measured in some way by our customers. Which is very, very encouraging.”

“One paper showed that the high-NA system maturity is far ahead of what we experienced on low-NA at the same stage of its introduction, supporting a much lower risk of insertion and adoption for our customers.”

- In early trading after the ASML results announcement, the company’s stock price dropped in value by around 5 per cent to trade at close to \$650 on the Nasdaq. Like many technology stocks, its valuation has experienced volatile swings in sentiment over the past couple of weeks.

But for now that valuation remains well down on the all-time high of more than \$1000, which was reached in June 2024.

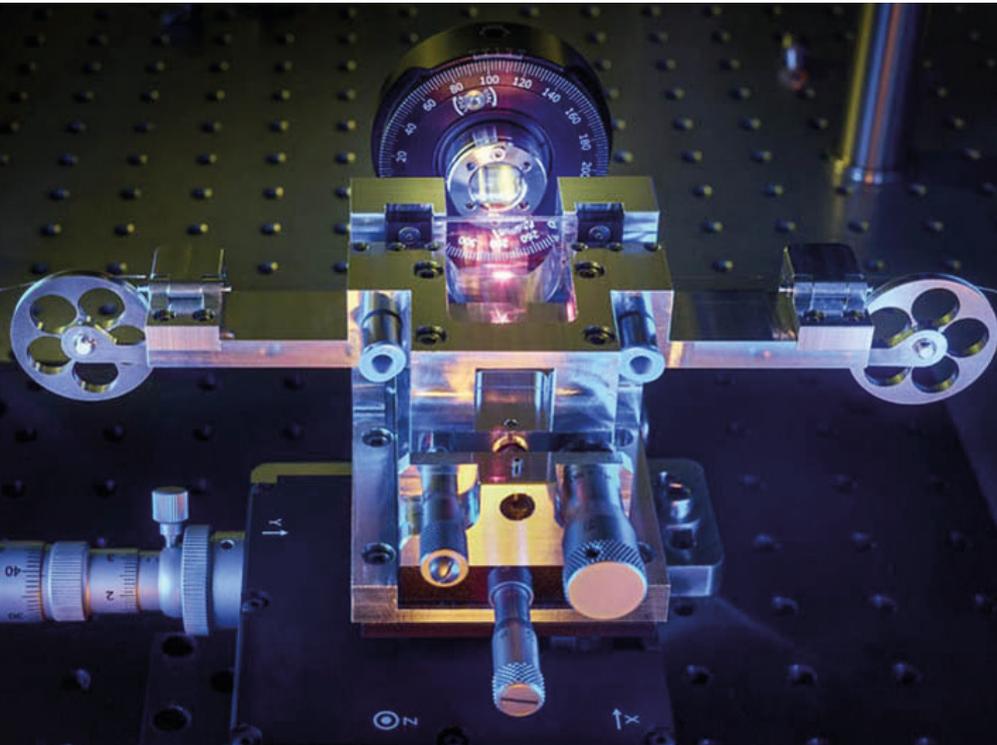
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ASML’s stock price dropped in value by around 5 per cent following the Dutch company’s latest results announcement and outlook, although that coincided with key AI player Nvidia’s announcement that it was now facing a \$5 billion hit to its finances because of new US rules requiring licenses for chip sales to China, with AMD processors also subject to the new requirements. The latest drop for ASML continues a significant decline that began last June, when the company’s stock price reached an all-time high.

# Fraunhofer ILT improves diode lasers thanks to fiber Bragg gratings...

...and Fraunhofer IWS spinoff Fusion Bionic wins Fraunhofer Founder Award 2024.



© Fraunhofer ILT, Aachen, Germany / Volker Lammert

*Exposure process: a USP laser writes a fiber Bragg grating into a fiber with a core diameter of 100 micrometers.*

Whether for applications in medical technology, telecommunications or aerospace, demand for high-power lasers is increasing in many industrial sectors. Users are focusing on how cost-effective and stable the systems are.

Now, Germany's Fraunhofer Institute for Laser Technology (ILT) says it has made significant progress in high-power diode lasers. It has transferred the writing of

fiber Bragg gratings from the world of fiber lasers to that of diode lasers. Dr. Sarah Klein developed the process as part of her dissertation and recently won third place in the prestigious Hugo Geiger Prize.

The complexity of fiber laser systems can be reduced enormously with fiber Bragg gratings. If the optical gratings are written directly into the fiber, they can replace external resonator mirrors. In 2019, within the BMBF-funded EKOLAS project, ILT took part in developing a process that had been established for inserting FBGs into the interior of single-mode optical fibers with a core diameter of 6  $\mu\text{m}$ .

Coordinated by Laserline, the consortium succeeded in writing the fiber Bragg gratings into quartz fibers with a core diameter of 100  $\mu\text{m}$  using USP lasers. The material melts briefly under the influence of the ultrashort laser pulses, cools down

again very quickly and changes its optical properties in the bulk material processed in this way.

A single FBG with a diameter of 100  $\mu\text{m}$  is sufficient to relocate the previously external resonator mirrors into the fiber and optimize multimode fiber lasers in many respects. As part of her doctoral thesis, the Fraunhofer researcher also transferred this process to fiber-coupled diode lasers.

## Same concept - new objective

In her work, Klein focused not only on multimode fiber lasers, but also on optimizing diode lasers, which are needed to pump solid-state lasers. This changes the objective. In contrast to fiber lasers, the FBGs are used in this application to improve the spectral properties of the diode laser radiation.

However, diode lasers emit broadband radiation. For this reason, the researcher developed a concept to reduce the bandwidth and stabilize the wavelength of the laser radiation. Once again, a directly inscribed fiber Bragg grating is central to this approach.

Thanks to this increase in brilliance, the energy input into the solid-state laser is many times more efficient and, therefore, more cost-effective: a significant advantage for industrial applications.

Klein continued to develop the process as part of an in-house project at the Fraunhofer-Gesellschaft. Here too, as in the EKOLAS project, her aim was to inscribe the optical gratings in multimode fibers used as waveguides for diode lasers. "Normally, laser technology is all about miniaturization. In my research work, it was exactly the opposite," she said. She had to transfer the USP process, developed for a core diameter of six micrometers, to a diameter of 100  $\mu\text{m}$ .

It was extremely complicated to seamlessly and precisely align the FBG segments; furthermore, energy management was very challenging. In order to inscribe the many gratings in the much larger multimode fibers in a single step, she would theoretically have had

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*Sarah Klein clamping the fiber for the exposure process.*

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## Fraunhofer ILT improves diode lasers thanks to fiber Bragg gratings

to multiply the energy input. However, this option was ruled out from the very beginning.

Klein mastered the challenge by lining up over a dozen of the FBGs, which are only 6  $\mu\text{m}$  in size, in several exposure processes. It was important to work seamlessly. "The writing process would have been much easier with an angular core geometry," she said. Writing the FBG up to the outermost edges was enormously complicated in terms of the required precision.

## Spin-off Fusion Bionic Wins Fraunhofer Founder Award

On February 19, 2025, the Fraunhofer Founder Award, endowed with 50,000 euros, was presented to Fusion Bionic, Dresden, Germany. The Fraunhofer Institute for Material and Beam Technology (IWS) spin-off impressed the judges with its bio-inspired laser technology.



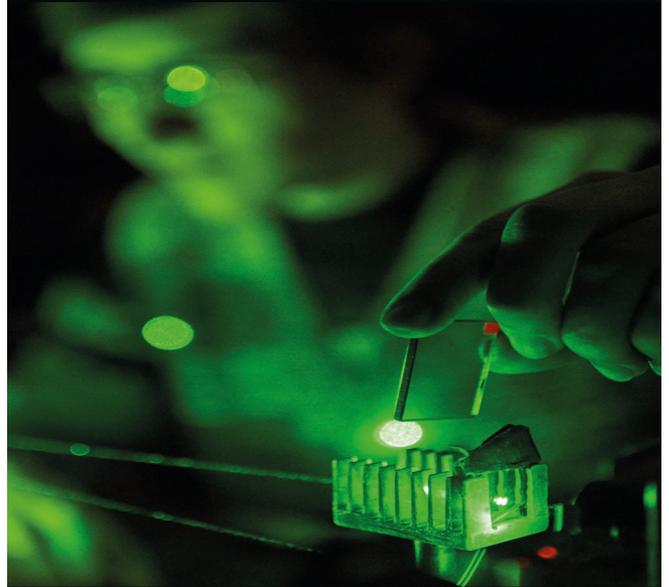
Fraunhofer Founder Award winners: Fusion Bionic.

Fusion Bionic applies bio-inspired principles, such as the lotus (surface) effect, to technical surfaces using an ultra-fast laser process. The resulting bionic effects are based on extremely fine micro- and nanotextures that significantly improve the performance of surfaces.

Fusion Bionic's solutions are based on direct laser interference patterning (DLIP), a high-speed laser technology up to 100 times faster than established methods. Fusion Bionic offers services spanning application development, technology training, contract manufacturing, and hardware solutions based on DLIP technology. In April 2021, Fusion Bionic GmbH was spun off from Fraunhofer IWS with a team of researchers led by Dr. Tim Kunze and experts from the industry.

<https://optics.org/news/16/3/9>

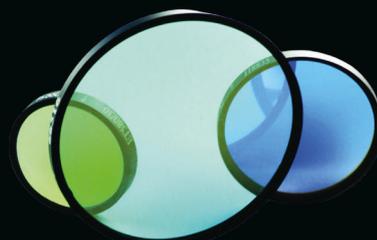
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# Zeiss and Tesa partner on large-scale holographic technology

Agreement targets mass production of functional holographic films, with key aim being automotive windshields.

Photonics and optics technologies developer Zeiss and adhesives specialist Tesa, both headquartered in Germany, are joining forces with the stated aim of "bringing holography to industrial scale".

The two companies have signed a strategic partnership agreement to drive the serial replication of large-format, holographically functionalized films – with a focus on transparent display applications in automotive windshields.

By combining Zeiss's microoptics expertise with Tesa's advanced adhesive technologies, the partnership aims to enable scalable, process-stable production of optical holographic components for integration into transparent surfaces such as glass.

A flagship project of the collaboration is the development of holographic display solutions for vehicle front windshields. These solutions promise reduced weight and installation space, while enabling additional visual and functional features for drivers and passengers alike.

## Pooling industry expertise

Both partners bring significant industry knowledge and experience in the industrial implementation of technological innovations: Zeiss as a leading provider of micro-optical components and Tesa as a long-standing development partner across various industries, focusing on self-adhesive product and system solutions.

"This partnership is a milestone in the industrialization of holography – especially for large-scale applications. Together with tesa, we are laying the foundation for bringing holographic innovation to market in a scalable and economically viable way," said Roman Kleindienst, Head of Zeiss Microoptics.

Tesa also sees the collaboration as a signal of what's to come. "As a long-standing partner to the automotive and consumer electronics industries, Tesa brings its extensive process and materials expertise to the partnership with Zeiss," said Dr. Ingrid Sebald, Board Member for Technology at Tesa.

"Together, we will significantly advance the serial replication of holographic solutions. With Zeiss, we have a global technology leader by our side – we look forward to working closely together and developing forward-thinking projects for our customers."

<https://optics.org/news/16/5/36>



Dealmakers: (L-R) Dr. Ingrid Sebald (Board Member Technology tesa), Dr. Norman Goldberg (CEO tesa), André Kutz (Head of ZEISS Photonics & Optics), and Roman Kleindienst (Head of ZEISS Microoptics / EVP ZEISS Microoptics) formalize the strategic partnership between tesa and ZEISS to industrialize large-area holography technology.



Sponsored Editorial

# Full characterization of microlenses using white light interferometry (WLI)

Microlenses are widely used in imaging applications from mobile phones to automobiles to mainly focus light precisely onto imaging sensor. The simplest microlens, a spherical lens, has a fixed radius of curvature but is often replaced by more complex aspheric for sharper focusing, less distortion, and astigmatism correction tailored to a specific use case. Aspheric lenses do not have a constant spherical shape, which makes

angstrom precision to height measurements up to 10 mm.

Different magnifications are also available, ranging from low magnification with large fields of view to higher magnification with improved lateral resolution. If the microlens doesn't fit into a single field of view, multiple images can be stitched together to create one large image.

automatically detect and evaluate up to 42 parameters per lens, identify surface defects based on customizable thresholds, and provide detailed results for both individual lenses and the entire array.

Zernike analysis is a fully automated process that centers the lens, removes the substrate, and uses orthogonal circular-function fitting to extract up to 36 Zernike parameters, along with standard radius of curvature and surface texture values. Asphere and Zernike wavefronts can be generated from optical design data and subtracted from the measured microlens using automated algorithms, which also align the wavefronts and provide residual images for further analysis. Fresnel analysis detects and reports step depths on diffractive microlenses, supporting up to 14 steps automatically, with the option to use Multiple Region analysis for more complex structures.

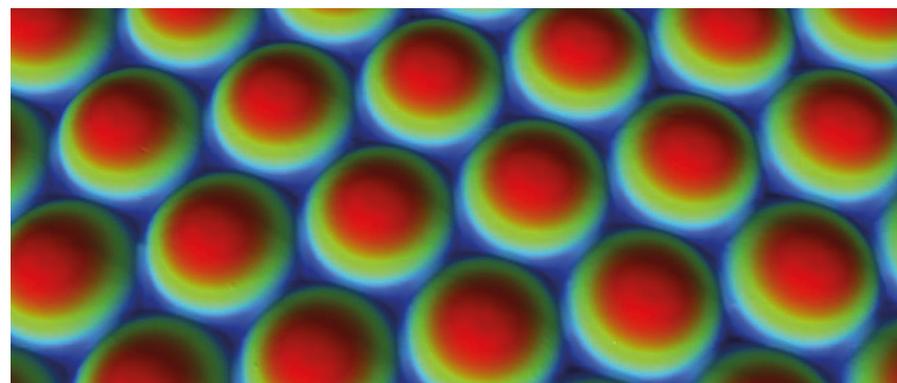


Figure 1. Microlens array used for light focusing onto sensor.

characterization more challenging. Newer Free-form optics are even more complex in design but enable improved performance and new functionality while potentially reducing size, weight, and cost. All of these lens types are typically fabricated by etching or molding glass, silicon, infrared crystals, or plastic substrates to create an array of microlenses which can be fully characterized with Bruker WLI as seen in Figure 1.

## Bruker's WLI Data Collection and Analysis

Various measurement modes are available for microlens characterization, offering different strengths and resolutions—from sub-

Radius of curvature (ROC) is the most critical of the shape parameters along with defining whether the lens is convex, plano, or concave, for determining the optical path length of the light rays. Bruker's SureVision software enables fast, automated analysis of ROC, height, and diameter, along with surface and conic parameters.

Microlens arrays are composed of multiple lenses arranged in one- or two-dimensional patterns on a substrate, where precise measurements such as pitch, diameter, and height are essential. Bruker's Multiple Region (MR) analysis within Vision64® software can

## Conclusion

Fully characterizing microlenses can determine the functionality which leads to improved designs, performance and increased reliability. White-light interferometry is a fast, accurate and efficient 3D non-contact optical profiling technique that can be used to quantify shape, surface texture while detecting defects and is useful for visualization of any microlens shape.

## Authors

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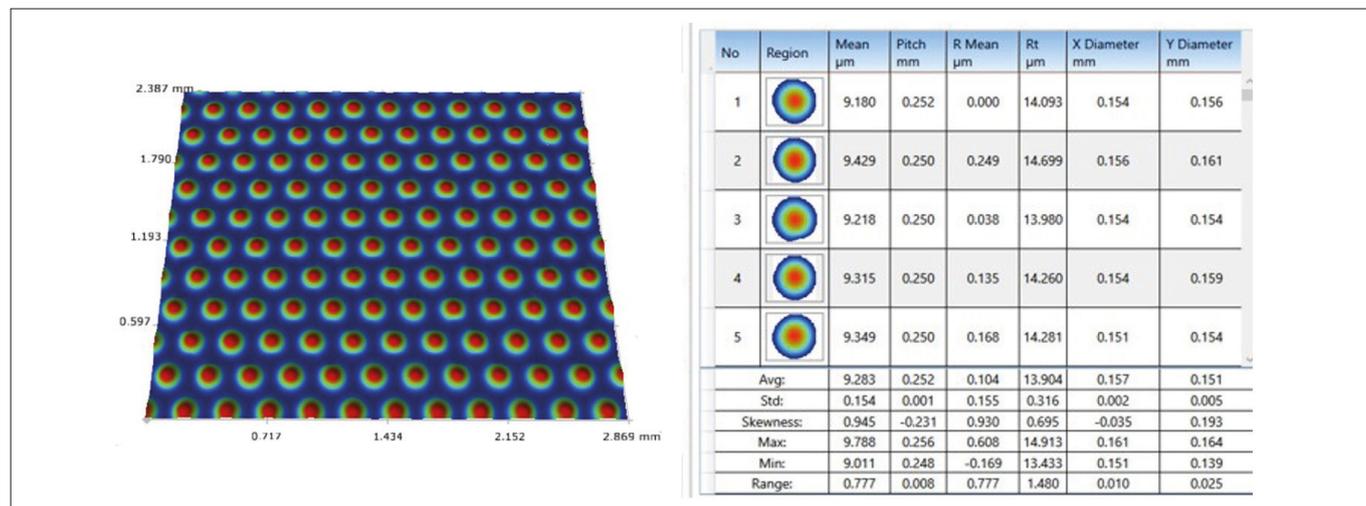
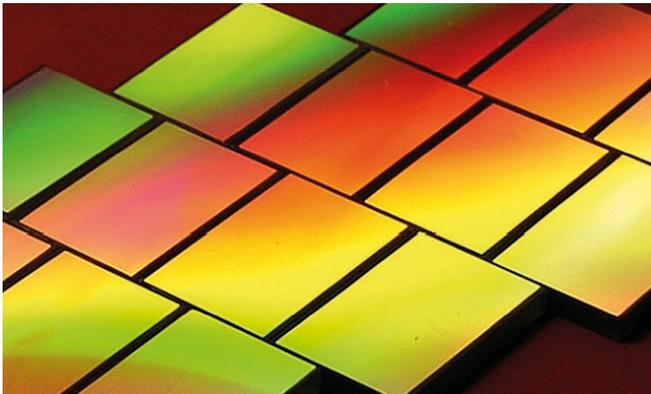


Figure 2. Microlens array analysis using Multiple Region including some selected output parameters (Raw image and MR analysis).

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## Spectrum Scientific Inc. – precision optics for tomorrow's technologies

Spectrum Scientific Inc. (SSI), established in 2004 and headquartered in Irvine, California, stands at the forefront of optical innovation. Specializing in high-volume manufacturing of aspheric and freeform reflective optics, SSI employs advanced optical replication techniques to produce components with exceptional precision and cost-efficiency. This approach enables the company to deliver high-fidelity mirrors at a fraction of the cost of traditional manufacturing methods.

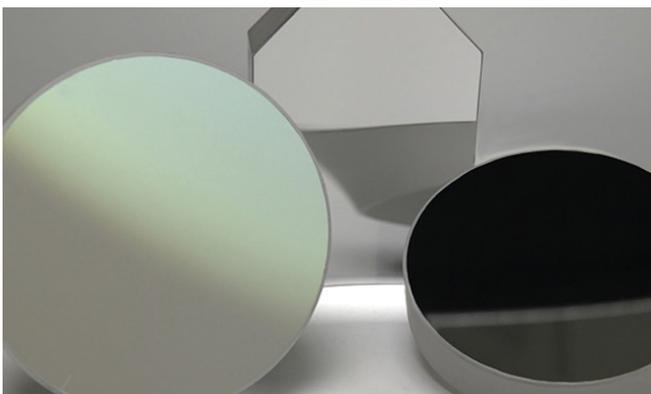


SSI's product portfolio includes a diverse range of optical components such as off-axis parabolic mirrors, ellipsoidal mirrors, freeform mirrors, hollow retroreflectors, and holographic diffraction gratings. Notably, their proprietary blazing technique for both plane and concave holographic gratings ensures high efficiency in the ultraviolet spectrum and reduced stray light, making them ideal for applications in life sciences, analytical instrumentation, and in space missions such as the Orbiting Carbon Observatory (OCO) and Ozone Mapping Profiler Suite (OMPS).

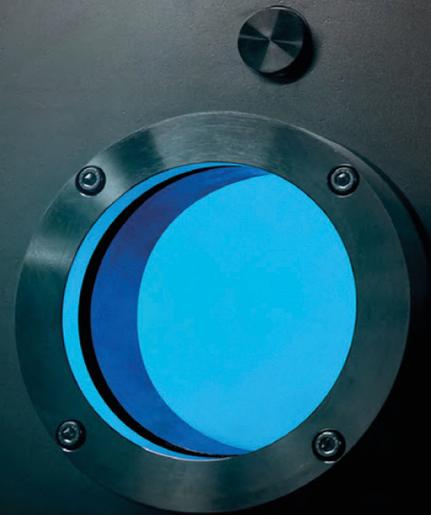
The company's commitment to quality is underscored by its ISO 9001:2015 certification and RoHS compliance. Additionally, SSI's manufacturing facilities adhere to stringent standards, including a silicone-free environment suitable for space-qualified components.

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# Distribution of light means the distribution of information: the use of piezo technology for optical fiber switches

Lisa Gräfe, piezosystem jena

The use of piezoelectric technology in fiber optic switches is fundamental for optical data transmission in automated and quality-critical production environments. The precise distribution of light over optical fibers enables effective distribution

such as PZT (lead zirconate titanate) are typical representatives of piezoelectric materials. They are used in actuators and sensors, for example for the fine alignment of glass fibers.



Figure 1: Fiber Optical Switch 1x4 Modules of piezosystem jena

of information. Optical switches can help to bundle process streams and thus reduce investment costs.

The optical industry is showing increasing interest in piezoelectric fiber optic switches, particularly in the areas of signal processing and laser technology. A distinction is made between multimode and single-mode fibers. Multimode fibers transmit light over several modes, are suitable for short distances and high data rates and are used, for example, in sensor technology and research. Single-mode fibers, on the other hand, offer precise transmission over long distances and are essential for high-speed networks.

The underlying piezoelectric effect describes the occurrence of electrical voltage through the mechanical deformation of certain materials (direct effect) as well as the reverse effect (indirect effect), in which mechanical movements are caused by electrical fields. Materials

The switching principle is based on piezoelectric bending elements, which enable fast and precise movements. These microactuators can align fibers with high precision and thus realize direct optical coupling. The switching process takes place within a few milliseconds with low insertion loss and minimal crosstalk (down to -70 dB). Variants such as 1x2 or 1x3 switches can be cascaded to 1x9 systems.

The advantages of this technology are low energy losses, a long service life of over  $10^9$  switching cycles, independence from polarization and wavelength and they are protected against humidity up to 98 %RH. Current research is focusing on improved coatings and new coupling methods to further minimize these limitations.

Areas of application include spectroscopy (e.g. Raman, UV/VIS, NIR), metrology and laser technology. Piezoelectric fiber optic switches are considered a promising solution for the future of spectroscopy. They combine speed, precision and energy efficiency. Continued research and development will further improve this technology and expand its use within the optical industry.

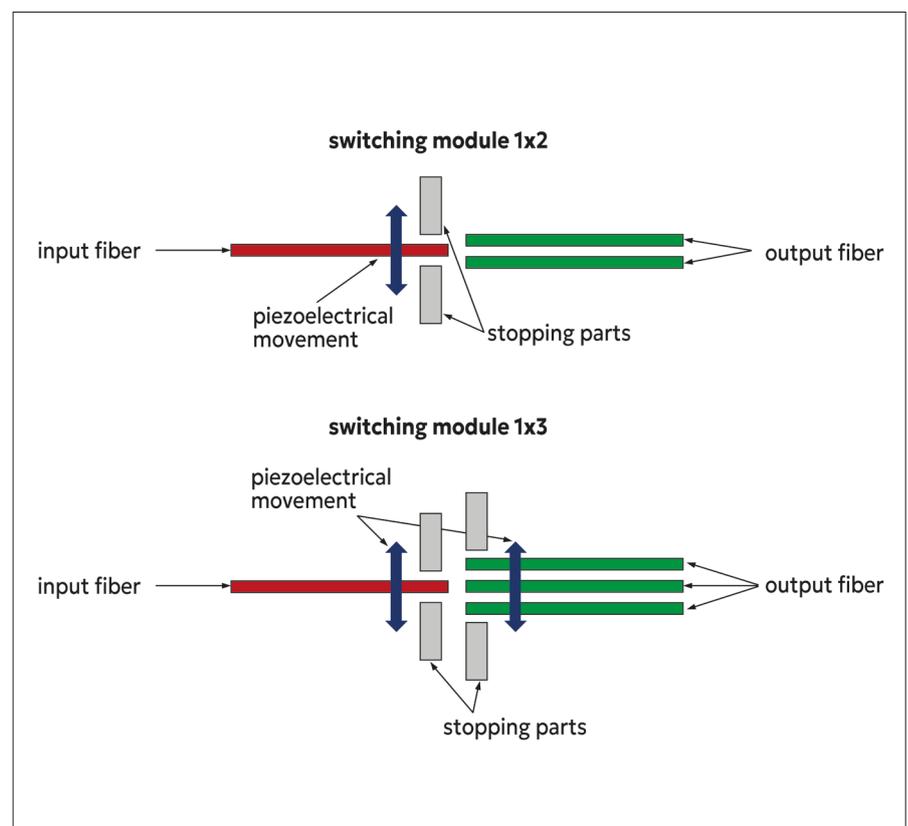


Figure 2: Switching principles of the 1x2 and 1x3 modules.



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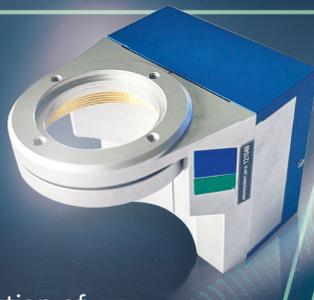
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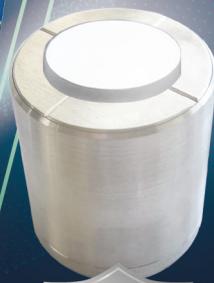
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## From Ocean Floors to Orbit: Fiber Solutions You Can Trust

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