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LASER 2023 announces support program and slogan 'Breadth that goes deep'

Variety of market views in forums; networking events; and Innovation Awards at rebooted Munich expo.

Welcome to the Laser World of Photonics in Munich. Organizer Messe Munich has announced that the comprehensive supporting program will "inform about the latest trends in the industry, provides application-oriented knowledge, offers young talent a stage, and leaves plenty of room for personal exchange with experts"

Among the focus topics are integrated photonics and sustainability. Visitors to the trade fair can get even more know-how from related topics in the supporting program for World of Quantum and Automatica, being held at the same time.

Exhibition Director Anke Odouli commented, "The range of applications for photonics is now immense, with barely an industry that can do without it when it comes to innovations. We reflect this variety in the LASER World of Photonics supporting program: With top-class presentations, panel discussions and special activities, we want to provide visitors with practical knowledge to give them an edge."

Expert knowledge

At this year's photonics forums, key players in the industry will share information about the latest fields of application for lasers and photonics. The Lasers & Optics forum (Hall A2) will cover topics such as integrated photonics and long pulse lasers, while the Laser Materials Processing forum (Hall B3) will be about electric mobility or additive manufacturing, for example. The Biophotonics & Medical Applications forum (Hall B2) will, among other things, address AI and VR applications in medicine or the use of photonics in pathology and laboratory medicine.

At World of Quantum (Hall A1), scientists and exhibitors will share their expert knowledge of quantum technology in a comprehensive forum program. LASER visitors can also use their trade fair ticket to visit the automatica lecture program to learn more about the latest trends in the automation industry.

On two guided tours with keynote speech and subsequent Q&A session, experts from the ultrashort pulse laser network will provide a compact overview of their field of work. One tour covers laser sources, optics and beam guidance and shaping (June 28,



Image: LASER World of Photonics / Messe Munich.

In the Photonics Forums, key players from industry will provide information on the latest applications of lasers and photonics.

10:00 a.m.), the other covers machines and processes (June 29, 10:00 a.m.). The guided tours in English are free of charge but advance reservation is required.

Materials processing

Distributed over 400 square meters, the special exhibition "Photons in Production" in Hall B3 will present the latest from the field of laser material processing. Experts will give live demonstrations of process monitoring in beam shaping using ring mode lasers and a networked laser material processing system that uses artificial intelligence to provide quality assurance.

The special exhibition will be held together with the Institute for Machine Tools and Industrial Management at the Technical University of Munich, the Bavarian Laser Center Erlangen and the Chair of Photonic Technologies at Friedrich-Alexander-University Erlangen-Nuremberg. As in the previous year, scientists will also offer advice on the use of lasers in production in the Solution Center.

The Solution Pitches are a new offering, resulting from the close link between laser material processing and automation – the topic of automatica being held at the same time. Two exhibitors from each of the trade fairs will have 30 minutes to present

a successful, industry-ready showcase that solves a production-related challenge.

Innovation Award

The Innovation Awards are presented in eight categories for the best future-proof solutions and products in the industry. This year's awards mark three years of presentations at LASER (in cooperation with Europa Science).

The Career Center in Hall B3 and Career Now, being held alongside automatica in Hall B4, will address individual future prospects, including: free coaching sessions, tips on applying and job hunting, as well as plenty of job and internship offers to support professional newcomers.

Future greats of quantum technology can prove themselves in the Qiskit hackathon at World of Quantum which starts on June 27 and invites the quantum community to a 24-hour competition in Hall A1. Qiskit researchers and developers will act as mentors for the participants during the competition, and an expert jury will select the winners at the end. A separate career day at World of Quantum on June 30 in Hall A1 will show the career opportunities that quantum technology has to offer.

<https://optics.org/news/14/5/32>

US AIM Photonics launches new opto-electronic testing services

Expands access to client firms to advanced testing capabilities for prototypes.

AIM Photonics, the industry-driven research institute based in Albany, New York, has announced the launch of its new Opto-electronic Testing Services, which feature a full suite of advanced tools for testing both photonic integrated circuits (PICs) as well as conventional electronic ICs.

The new service will be offered through AIM's Test, Assembly and Packaging facility in Rochester, NY, which AIM

passive optical, active optoelectronic, telecom/datacom, and RF and DC testing. "Providing access to these services is core to our mission to expand the silicon photonics ecosystem," Striemer added.

Multiple tools

"With this toolset, we are able offer a wide range of testing capabilities for on-wafer, die-level, and packaged devices, all aimed at achieving consistent and

reliable results to support our members' and customers' prototype development." Striemer also said that the funds recently authorized through Empire State Development by the NYS Photonics Board will further expand AIM Photonics' test and measurement capabilities over the next several years through additional hardware and partnerships with Rochester area colleges and universities.

"Our customers include not only small businesses, academics, and of course our government partners, but also research and development groups in companies—both large and small—that want to explore photonics without having to invest in testing infrastructure," said Amit Dikshit, design enablement manager at AIM Photonics.

Purchasing advanced test and measurement tools can be cost-prohibitive for many companies, particularly start-ups with limited resources, Dikshit added. "Even basic test capability could cost several hundred thousand dollars and take up to a year to purchase, install and test," he said.

"Having access to our extensive testing capabilities—as well as our finely-tuned methodologies—allows our members and customers to leave the testing to us, freeing them to focus their efforts on designing and developing their own innovative devices and technologies," Dikshit said.

<https://optics.org/news/14/5/34>

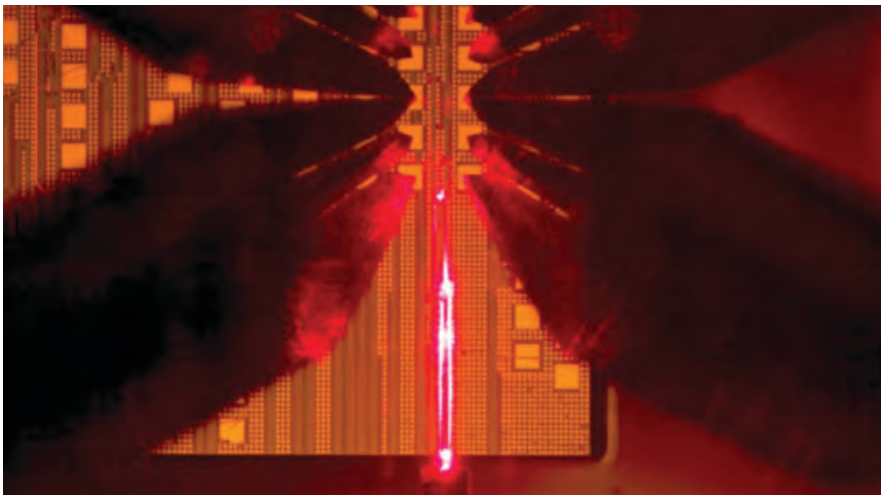


Image: AIM Photonics.

Die-level edge-coupling based electro-optic measurements.

says is the only place in the U.S. that provides access to both photonic and electronic test, assembly, and packaging prototyping services for substrates up to 300 mm wafers.

"Our comprehensive toolset can test and measure multiple performance aspects of electronic and photonic devices before and immediately after package assembly, allowing for rapid verification and optimization of the manufacturing process all in the same R&D center, saving our members and customers valuable time and resources," said Chris Striemer, Business Development and Facilities Manager at AIM Photonics test, assembly and packaging facility.

AIM's Opto-electronic Testing Services currently include over 30 tools for

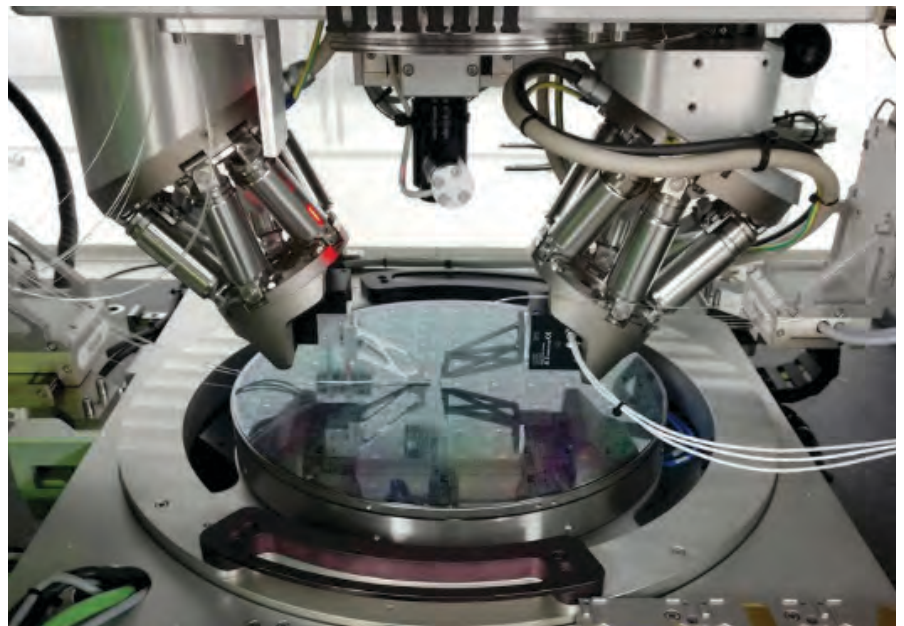


Image: AIM Photonics.

The large automated prober in AIM Photonics' test lab enables programmable optical, DC and RF interrogation of wafer substrates as large as 300 mm, with additional flexibility for die-level testing.

Fraunhofer ILT develops compact laser scanner for industrial applications

“SWELL” project to demonstrate laser “power beaming” in space – as part of the DOD’s latest mission to the ISS.

A compact galvanometer laser scanner developed by Fraunhofer ILT has been designed to suit new applications in 3D printing, micromachining or medical technology.

The scanner occupies only 50 cubic centimeters, according to the designers, and features an architecture which combines the scanner drive and mirror substrate to save up to 90 percent of the normal installation space.

“Commercially available galvanometer scanners with an aperture of 10 millimeters require 10 to 50 times the installation space of the planar galvanometer scanner,” commented Fraunhofer ILT.

“As this space is reduced, so is the weight of the scanner unit, an advantage that opens up a host of new applications and opportunities to increase productivity.”

In particular, reductions in weight and volume could help the new scanner to be integrated into applicators for hand-guided laser processes in medical technology and laser drilling processes, without sacrificing precision or dynamics. The device is also suitable for all hand-held laser marking and engraving systems.

The new Fraunhofer ILT design builds on the research center’s work on galvanometric scanners, where the laser scanning operation is carried out through rotation and orientation of a planar reflecting surface, as complementary devices to polygon scanners in which a polygonal mirror is employed instead.

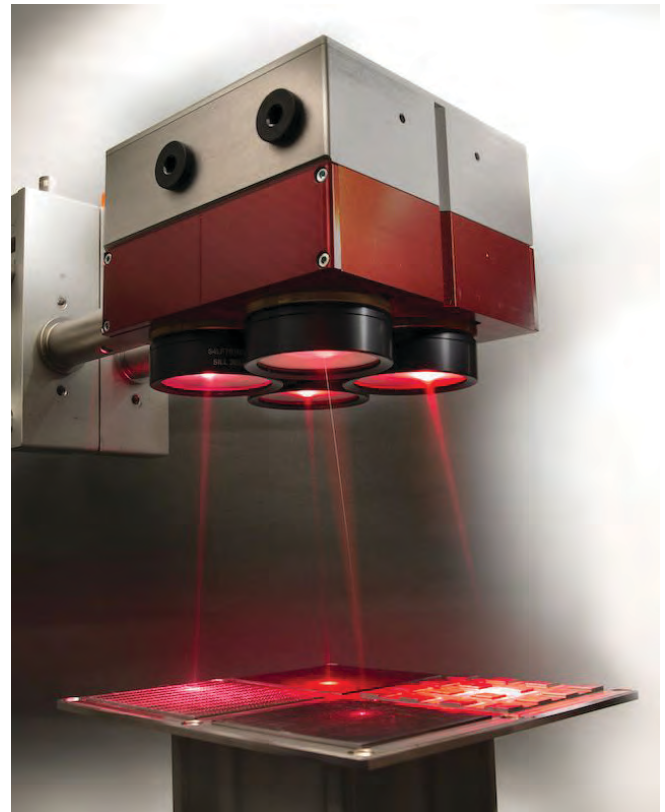
A galvanometer approach can guide the laser beam focus dynamically along a component surface and close to its contour, according to the designers, with special components and controls now developed by Fraunhofer ILT specifically for these systems to allow short cycle times.

On show at LASER World of Photonics

The compact design also enables multiple scanners to be integrated into a single processing head, and for this purpose the Fraunhofer researchers have built and characterized a demonstrator with four 2D deflection units. This scanner array has an overall construction volume of 140 by 140 by 90 millimeters.

In trials, Fraunhofer ILT has used the system with laser powers of up to 150 watts per scan head for laser marking and engraving applications, in which it delivered comparable accuracy and dynamics to conventional galvanometer scanners. Other tests included 3D printing, micromachining, paint stripping and decoating, where the presence of four or more scanners allows processing tasks to be parallelized, leading to improved productivity.

The mini scanner uses commercially available model-based control electronics, for ease of integration into existing production lines using standardized communication protocols. Fraunhofer ILT believes that the closed-loop control available for the new scanner



Credit: Fraunhofer ILT

Based around galvanometer scanning modules, the new device suits hand-guided laser processing.

is more robust, precise and faster than conventional controllers, and bespoke systems tailored to customers’ specific needs can be supplied.

A prototype of the mini scanner will be on display at the Fraunhofer booth at LASER World of Photonics in Munich from June 27 to 30th.

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Laser fusion startups win US Department of Energy backing

Xcimer Energy and Focused Energy among eight small companies sharing \$46M to deliver pilot-scale fusion within a decade.

Two startup companies working on laser-driven approaches to fusion energy have won significant financial support in a round of funding just announced by the US Department of Energy (DOE).

California-based Xcimer Energy and the US-German company Focused Energy, which has a base in Texas, are among eight companies sharing \$46 million that is intended to help deliver a pilot-scale demonstration of fusion energy by 2032.

"Within five to ten years, the eight awardees will resolve scientific and technological challenges to create designs for a fusion pilot plant that will help bring fusion to both technical and commercial viability," announced the DOE.

The \$46 million "milestone program" covers the first 18 months of activity, although projects may last up to five years in duration - with subsequent spending plans contingent on approvals made by US Congress.

KrF excimer approach

In its own announcement of the funding, Xcimer said that it was receiving \$9 million under the scheme to develop its KrF excimer-laser-based fusion system.

"Laser inertial confinement fusion (ICF) is the only fusion approach that has reached scientific breakeven, achieved in December 2022 at the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL)," pointed out the Redwood City firm.

"The Xcimer team will leverage this accomplishment and the significant progress made by the laser fusion community to advance inertial fusion energy (IFE)."

Its CEO and co-founder Conner Galloway added: "Xcimer's innovations directly address the remaining challenges in

deploying laser-driven IFE and enable the fastest and lowest-risk path to put fusion power on the grid."

Xcimer, whose team includes collaborators at the University of Rochester's Laboratory for Laser Energetics and LLNL, among others, has attracted seed funding from private backers including Prelude Ventures.

Its technological approach - based around the "HYLIFE" chamber concept developed at LLNL - is intended to dramatically reduce the cost of the laser system, the most expensive component of an IFE power plant.

"A low-cost laser enables economical production of laser energies of tens of megajoules, which allows direct scaling of the hotspot ignition mechanism proven at the NIF to larger, more reliable, higher-yield fuel capsules," explains the firm.

"The higher energy output from larger

capsules permits operation of a power plant at a repetition rate of under one shot per second, significantly reducing engineering risk relative to other IFE concepts."

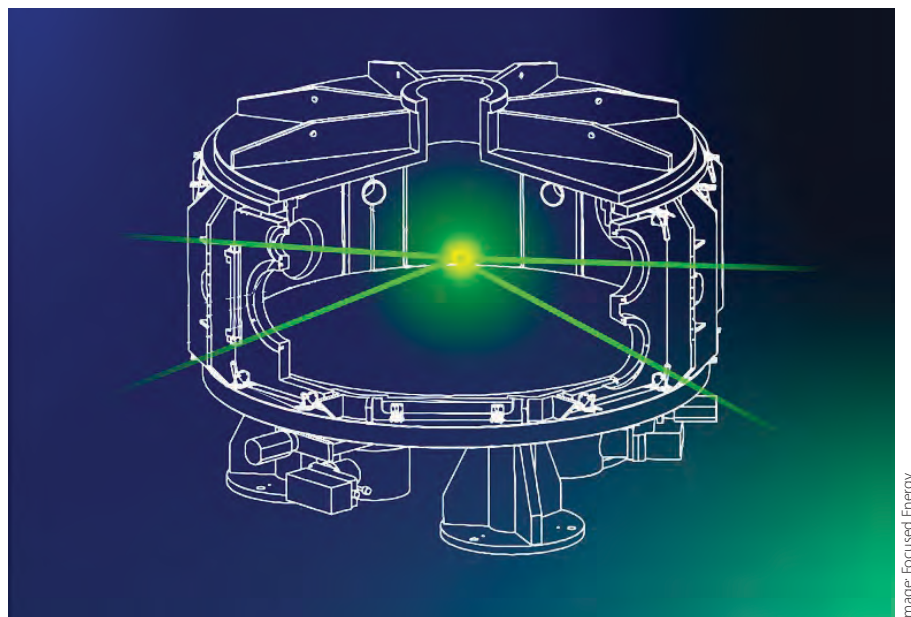
Colorado facility

In a virtual discussion (see below) following the DOE announcement hosted by the DOE's Office of Science director, Asmeret Asefaw Berhe, Xcimer's VP of reactor and plant design Susana Reyes said that the company was planning to build its prototype laser facility in Colorado, and already engaging with local universities and schools over workforce requirements.

The 10 MJ-scale excimer system envisaged by the company is expected to deliver ten times the laser energy that NIF was capable of, at "orders of magnitude" lower cost. Excimer sources have been widely deployed in semiconductor lithography equipment, although a different approach is used in the latest extreme ultraviolet (EUV) systems.

Focused Energy, which was founded by a team including the University of Texas, Austin, professor Todd Ditmire and his Technical University Darmstadt counterpart Markus Roth, has previously raised \$15 million from venture supporters including the former Major League Baseball star Alex Rodriguez.

continued on next page



Focused Energy's "T-Star" laser scheme is expected to feature in the US-German startup's initial technology demonstration facility, which it is hoped will be built around 2030. Focused Energy and Xcimer Energy have just won support from the US Department of Energy, alongside six other early-stage companies working on fusion energy systems that do not feature lasers.

Image: Focused Energy.

continued from previous page

Laser fusion startups win US Department of Energy backing

In September 2021 the company said it was planning to build a high-repetition-rate laser test facility to define the layout for the construction of a future ignition facility by 2025, with a prototype power plant anticipated by around 2030.

The six other companies supported by the latest DOE funding, who are not pursuing laser-based approaches to fusion, are Commonwealth Fusion Systems, Princeton Stellarators, Realta Fusion, Tokamak Energy, Type One Energy Group, and Zap Energy.

Supply chain challenge

News of the DOE support comes two weeks after the Washington, DC, based Fusion Industry Association (FIA) said that annual supply-chain spending on fusion components and materials was



expected by its members to balloon from \$500 million in 2022 to \$7 billion when the initial fusion power plants are built.

However, the FIA's survey results also indicated that suppliers are reluctant to make the necessary investments at the moment, because building the capacity to meet future demand right now is deemed too risky without committed orders.

"The projected growth of the fusion industry creates a huge business

opportunity for current and new suppliers," said FIA's CEO, Andrew Holland. "It is clear [that] more long-term certainty is needed - through a mix of finance, regulation, risk-sharing mechanisms, and more communication - so suppliers are prepared to scale ahead of industry need.

FIA members include both Xcimer Energy and Focused Energy, while the major laser provider Trumpf is an affiliate member.

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Trumpf to show how AI can make manufacturing more efficient

Presentation at LASER 2023 will highlight benefits of artificial intelligence in manufacturing.

High-tech company Trumpf has developed an AI application for lasers that it says makes manufacturing even more efficient. Electric car manufacturers, for example, could use it to produce more electric motors in less time. It also results in less rework and scrap.

Christian Schmitz, CEO Laser Technology Trumpf, and AI expert Florian Kiefer made the announcement as part of a pre-LASER 2023 virtual press conference from Trumpf's headquarters in Ditzingen, Germany, on June 6th.

"In the future, we want to use AI to raise the overall system of lasers, optics, sensor technology and software to a new level of performance. We are therefore pushing ahead with the development of further AI solutions that will make laser processes in industry even more powerful and profitable," said Schmitz.

He added that the AI process has already proven itself practically in series production for e-mobility and can be used in a variety of laser welding applications; "AI makes production significantly more robust."

Here at the LASER World of Photonics expo, Trumpf will be demonstrating for the first time how AI supports laser welding: it is presenting its AI solutions EasyModel AI, which creates an algorithm and the AI Filter for VisionLine Detect, which applies the algorithm (to the manufacturing process).

To ensure that the weld seam is always in the right place, the laser's sensor technology has to position the weld geometry precisely on the component – to minimize the risk of rejects.

Dirt or scratches on the component, poor lighting conditions in the work

area or highly reflective materials such as copper make positioning difficult. Trumpf says "[our] AI solution supports image processing and thus reduces such interference".

User trains AI

The user must train the artificial intelligence before it is used. To do this, the machine setter marks the relevant component areas in the corresponding image medium, for which programming knowledge is not required.

Trumpf comments: "Using this system is as simple and intuitive as using the painting and drawing programs that everyone knows from smart phones or computers. The AI model created by the training is then used in the AI filter for the VisionLine Detect image processing system."

<https://optics.org/news/14/6/14>



Image: Trumpf.

Trumpf's EasyModel AI system. With the AI solution EasyModel AI, the user can create an algorithm.



Image: Trumpf.

Trumpf AI panel: Gabriel Pankow, Communications; Christian Schmitz, CEO Laser Technology; and Florian Kiefer, AI Expert at Trumpf.



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Oldenburg develops 3D printing method to make ultrasmall metal parts

Applications in microelectronics, nanorobotics, and – significantly – battery technology.

A research team led by chemist Dmitry Momotenko of the University of Oldenburg, Germany, has developed a new 3D printing technique for manufacturing ultrasmall metallic objects. Using this, the researchers aim to substantially increase the surface area of battery electrodes to drastically reduce charging times.

It takes chemist Liaisan Khasanova less than a minute to turn an ordinary silica glass tube into a printing nozzle for a special 3D printer. The chemist inserts the 1 mm-thick capillary tube into a blue device, closes the flap and presses a button. After a few seconds there is a loud bang and the nozzle is ready for use.

"A laser beam inside the device heats up the tube and pulls it apart. Then we suddenly increase the tensile force so that the glass breaks in the middle and a very sharp tip forms," said Khasanova, who is working on her Ph.D. in chemistry in Oldenburg's Electrochemical Nanotechnology Group.

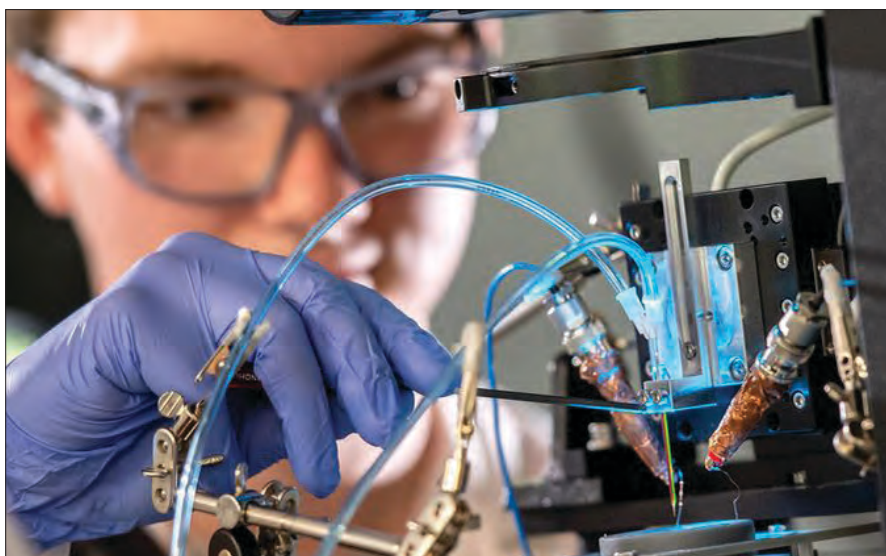
Khasanova and her colleagues need the minuscule nozzles to print incredibly tiny three-dimensional metallic structures. This means the nozzles' openings must be equally tiny—in some cases so small that only a single molecule can pass through.

Nano-scale 3D printing

Dr. Dmitry Momotenko, who leads the junior research group at the Institute of Chemistry, commented, "We are trying to take 3D printing to its technological limits. We want to assemble objects atom by atom."

Nanoscale 3D printing opens up "amazing opportunities," the chemist added. For metal objects in particular, he can envisage numerous applications in areas such as microelectronics, nanorobotics, sensor and battery technology. "Electroconductive materials are needed for all kinds of applications in these areas, so metals are the perfect solution," he said.

While 3D printing of plastics has already advanced into these nanoscale



Student Simon Sprengel makes some final adjustments to allow two metal solutions to flow simultaneously through the tiny printing nozzle.

Photo: UOL / Daniel Schmidt.

dimensions, manufacturing tiny metal objects using 3D technology has proven more difficult. With some techniques the printed structures are still a thousand times too large for many advanced applications, while with others it is impossible to fabricate the objects with the necessary degree of purity.

Dr. Momotenko specializes in electroplating. "A liquid salt solution becomes a solid metal—a process which we electrochemists can control very effectively," he said. Transferring this method to the nanoscopic scale requires



Dr. Dmitry Momotenko specializes in the 3D printing of metals. He wants to manufacture objects one atom at a time.

Photo: UOL / Daniel Schmidt.

considerable ingenuity. The group's small laboratory on the Wechloy campus confirms. The lab contains three printers, in which the key components are smaller than in conventional 3D printing systems.

Battery potential

In printing tests, the Oldenburg researchers have successfully created columns – the simplest geometric forms generated in 3D printing; they can also print spirals, rings and all kinds of overhanging structures. The technique can currently be used to print with copper, silver and nickel, as well as nickel-manganese and nickel-cobalt alloys.

In some of their experiments, they have already ventured deep into the nanoworld. Momotenko and an international team of researchers reported in *Nano Letters* (2021) that they had produced copper columns with a diameter of just 25 nm — taking 3D metal printing below the 100nm limit for the first time.

Dr. Momotenko's plans for his nanoprinting technique include laying the foundations for batteries that can be charged a thousand times faster than current models. "If that can be achieved, you could charge an e-car within seconds," he said.

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Oldenburg develops 3D printing method to make ultrasmall metal parts

The basic idea he is pursuing is already around 20 years old. The principle is to drastically shorten the pathways of the ions inside the battery during the charging process. To do this, the electrodes, which are currently flat, could have to have a three-dimensional surface structure.

In his NANO-3D-LION project, the goal is to develop and employ advanced nanoscale 3D printing techniques to fabricate active battery materials with ultrasmall structural features.

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Sales and profits up sharply again at Zeiss

German optics giant now employs more than 40,000 people for the first time - and still has 2000 vacancies in Germany alone.

Continued strong demand from the semiconductor industry has propelled Zeiss Group sales to another new record of €4.84 billion for the six months ending March 2023.



Photo: Zeiss Group.

With global employee numbers now at more than 41,000, Zeiss continues to hire at speed - saying it still has 2000 vacancies in Germany alone. The optics giant's sales look set to approach and possibly exceed €10 billion for the first time in its current fiscal year, which ends in September.

The German optics giant, which now employs more than 40,000 people across its global footprint, reported a 41 per cent year-on-year jump in sales at its semiconductor manufacturing technology (SMT) division, to €1.66 billion.

And despite macroeconomic and geopolitical worries, each of Zeiss' other three divisions was also able to post a rise in sales, albeit not with the same rate of growth as the SMT business.

The firm's medical technology unit reported sales of €1.18 billion, up 11 per cent on the comparable period last year, with the industrial quality and research microscopy division up 8 per cent to €1.14 billion, and consumer sales up only slightly, to €800 million.

"Despite the current slowdown in the semiconductor market, the high demand for the products of the SMT segment remains unchanged and has a significant impact on the strong growth in revenue in this area," Zeiss stated after delivering an 18 per cent rise in sales overall.

The firm performs a critical role in the semiconductor equipment supply chain, in particular providing the high-specification optics needed inside cutting-edge

lithography tools assembled by ASML - which itself owns a 25 per cent stake in Zeiss SMT.

Approaching €10BN annual sales

Zeiss CEO Karl Lamprecht hailed the latest figures, which included a 25 per cent rise in half-yearly earnings before interest and taxes (EBIT), to €917 million.

"We are continuing the Zeiss Group's dynamic growth from the previous year in the first half of 2022/23" he said. "Our substantial expenditure on research and development and our investments in global infrastructure are important elements of our long-term growth strategy and underpin the company's positive development."

Research and development spending in the latest half-year rose to another new high of €702 million, equivalent to nearly 15 per cent of sales.

Company CFO Christian Müller observed:

"The half-year results also demonstrate that Zeiss is in a very stable and financial strong position, while continuing to invest heavily in the future - this includes increasing capacities, such as building up infrastructure and personnel."

Despite employee numbers topping 40,000 for the first time, and up 6 per cent since last September, the company says it is still looking to add lots more people to its ranks.

"If the markets remain stable, we assume that growth will also continue in all four Zeiss segments in the second half of the fiscal year," Lamprecht said.

"This growth is also reflected in our personnel requirements, where, for example, we are currently looking to fill a round 2000 vacancies in Germany alone in order to continue to have the capacity to support our customers worldwide with innovative solutions."

If Lamprecht and Müller are correct, and all four divisions do continue to grow between now and September, it could see the company's annual sales figure exceed €10 billion for the first time.

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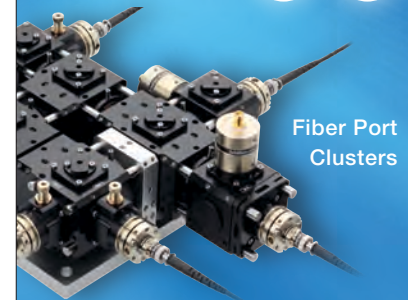
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Apple outlines use of one billion Trumpf laser components in iPhones

Used in proximity sensor to turn off display automatically when phone held to ear.

Trumpf Photonic Components, a developer of VCSEL and photodiode solutions for consumer and industrial sensing applications, has recently been highlighted as a key supplier by consumer tech giant Apple for the latter's work supporting the proximity sensor in iPhone.

Trumpf's components have long been used for a number of Apple products. In one deployment example, the proximity sensor for iPhone turns off the screen when it detects an object that is close by — such as when a user holds iPhone up to their ear — saving power and preventing inadvertent touches.

"We have already shipped over one billion of our VCSELs to Apple. It's great to see that our components are widely used in everyday life and enable great experiences," commented Berthold Schmidt, CEO at Trumpf Photonic Components.

"This success points out the huge potential of our VCSEL technology. Therefore, we plan to further expand our production site in Ulm with about 750 square meters within the next year, to guarantee high-volume, high-end manufacturing of laser components for our customers," Schmidt added.

Trumpf has already invested more than 40 million euros into the high-end facility since they took over the business in 2019.



Trumpf is further expanding its VCSEL production site in Ulm, Germany, with about 750 square meters within the next year.

Further investments to be made within the next five years will amount to tens of millions of euros, depending on project developments.

Other Apple supplier activities

Besides its Trumpf partnership announcement, Apple also stated this week that its spend with European suppliers has increased more than 50 percent since 2018, totaling €85 billion over the past five years and more than €20 billion in 2022 alone.

The investments are said to reach more than 4,000 European suppliers and support cutting-edge innovations that can be found in every product Apple makes, from

sensors in Apple Watch, to lasers in iPhone, to microcontrollers in Mac computers.

STMicroelectronics, a global semiconductor company with roots in France and Italy, develops and manufactures chips that contribute to the performance and efficiency of Apple devices. For many years, ST has worked with Apple on sensors, power management, and wireless integrated circuits for iPhone and other Apple products.

STMicroelectronics employs more than 27,000 workers across its European operations, and is investing more than €3.5 billion in 2023 to increase its manufacturing capacity globally, including in France and Italy, where it also manufactures components for Apple devices.

Austrian chip manufacturer ams is another European company to join Apple's Supplier Clean Energy Program. Companies such as DSM Engineering Materials in the Netherlands, Infineon in Germany and Austria, and Solvay in Belgium are supporting a range of renewable energy solutions, such as wind projects and onsite solar and innovative structures like virtual power purchase agreements.

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Apple spending with European suppliers has increased by more than 50 percent since 2018, fueling cutting-edge innovations in every product Apple makes.

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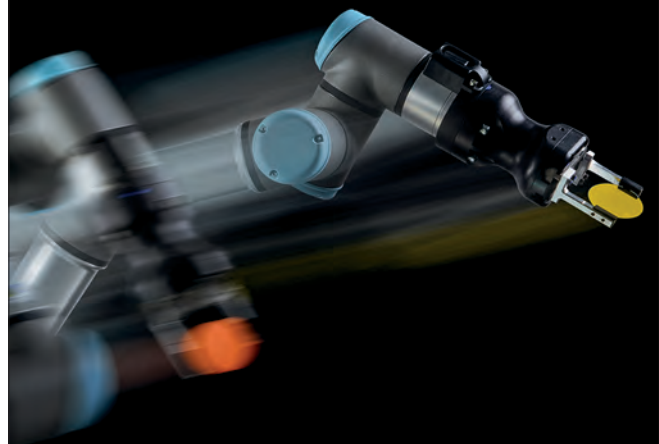
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Teledyne operates across four major segments: Digital Imaging, Instrumentation, Engineered Systems, and Aerospace and Defense Electronics.

Teledyne Technologies reports 'record' Q1 2023 results

Diversified tech firm's Q1 sales reach \$1.38bn up 4.7% on Q1 2022; plus new camera launches across divisions.

Diversified engineering and photonics company Teledyne Technologies has reported first quarter (Q1) 2023 net sales of \$1.38 billion, compared with net sales of \$1.32 billion for Q1, 2022, an increase of 4.7%. Net income attributable to Teledyne was \$179 million for Q1, 2023, compared with \$212.6 million (Q1, 2022), a fall of 15.9%.

Teledyne operates across four major segments: Digital Imaging, Instrumentation, Engineered Systems, and Aerospace and Defense Electronics.

Teledyne's non-GAAP Q1, 2023 net income was \$217.2 million (\$203.9 million in Q1, 2022). Operating margin was 17.5% for Q1, 2023 (16.9% for Q1, 2022). Excluding

acquisition-related transaction and purchase accounting expenses, non-GAAP operating margin for Q1, 2023 was 21.1% (21.0% for Q1, 2022).

Robert Mehrabian, Chairman, President and CEO, commented, "Our healthcare-focused imaging businesses achieved all-time record sales and even stronger orders, while our longer-cycle marine, aerospace and government businesses, collectively, also performed well."

Mehrabian added, "Our shorter-cycle commercial imaging and instruments businesses remained resilient with sales in the majority of product families increasing compared with last year. Supply chain challenges improved and premiums paid

for scarce electronic components declined. Finally, given record first quarter cash flow, our consolidated leverage ratio declined to 2.3x even after completing the ChartWorld acquisition [in January, 2023]."

Thermal by Flir expands with drone makers BRINC and Teal

Teledyne division Flir has announced "continued momentum within its Thermal by Flir program for small unmanned aircraft systems, highlighted by the integration of its Hadron 640R dual visible-thermal payload within the recently-announced Teal 2 drone and the Lepton 3.5 thermal micro camera within the BRINC LEMUR 2.

Mike Walters, VP, product management, at Flir commented, "The integration of the Flir thermal camera modules into the cutting-edge LEMUR 2 and the Teal 2 demonstrates our continued commitment to innovation and streamlined platform integration."

The Hadron 640R pairs a performance-leading 640x512 resolution radiometric Boson thermal camera with a 64MP visible camera in a single module. With a size, weight, and power (SWaP) optimized

continued on next page

continued from previous page

Teledyne Technologies reports 'record' Q1 2023 results

design, it is a suitable dual-sensor payload for integration into sUAS, unmanned ground vehicles, robotic platforms, and AI-ready applications.

"Flir maintains an impressive track record of innovation by developing industry-leading thermal imaging sensors and supporting integrators through the development and launch cycle," said George Matus, founder and CEO of Teal. "The Hadron 640R provides the military-grade Teal 2 with the situational awareness front-line personnel require to dominate the night in support of defense and public safety operations in a variety of environments."

One of seven advanced sensors integrated into the LEMUR 2, the Lepton micro thermal camera is small enough to rest on the tip of a finger, providing 160x120 thermal resolution for capturing accurate, calibrated, and noncontact temperature data within a lightweight and low-power package. It helps provide law enforcement and emergency services with greater situational awareness in total darkness or smoke without placing personnel in danger.

Shutterless version of compact thermal camera

Teledyne Dalsa has launched a shutterless version of its MicroCalibir Long Wave Infrared (LWIR) compact camera platform. Developed and manufactured in Canada, the MicroCalibir platform is the result of the latest advances made by the integration of their in-house 12 μm microbolometer pixel technology with a deep-ADC ROIC circuit. This novel ROIC



Image: Teledyne Flir / Teledyne Dalsa.

New views: (L) the Hadron 640R; and (R) shutterless MicroCalibir LWIR camera.

design results in a 1000°C intra-scene temperature range at a sub-40mK NETD. The developer says that this platform design "makes it easier to withstand high levels of vibration or g-shock which are crucial factors in applications such as smaller hand-held thermal imagers, thermal weapon sights, surveillance, and small drone applications."

MicroCalibir is supplied without a housing and with an M18 interface (for QVGA video format) or M24 in VGA format. The new model is also smaller and lighter than the standard MicroCalibir, measuring only 21 mm x 21 mm x 12.9 mm with lens mount and electronics boards, and weighing only 10 grams.

Later in 2023, says Teledyne Dalsa, the MicroCalibir family will be further expanded with the introduction of a radiometric version for applications that require temperature information.

<https://optics.org/news/14/4/51>



Thermal By Flir collaborators Teal and BRINC mark the next generation of small thermal-equipped unmanned aircraft for defense and public safety use.

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MKS Instruments first quarter 2023 results show hints of recovery

Announces that its global operations are “restored” following February, 2023, ransomware attack.

MKS Instruments, the industrial equipment provider that owns major photonics brands including Spectra-Physics lasers, Newport, and ESI among others, has this week reported its first quarter 2023 financial results. Quarter highlights included: total revenue of \$794 million; a GAAP net loss per diluted share of \$0.64; non-GAAP net earnings per diluted share of \$0.48; operating cash flow of \$37 million, and free cash flow of \$20 million.

In March, 2023, the company announced that February’s ransomware attack would hit sales in the opening quarter of 2023 “by around \$200 million”. In fact, this week’s newly-released figures reflect an almost \$300 million drop between Q4, 2022 and Q1, 2023 – with the latest quarter’s total net revenues sliding to \$794 million from \$1,085 million.

However the Q1, 2023 total revenues were up \$52 million on the prior year’s equivalent quarter, driven by stronger revenues from electronics and packaging, and speciality industrial divisions, more than offsetting a slump in semiconductor revenues.

‘On track for Q2 recovery’

“We have restored our global operations following the ransomware incident we identified in February and are on track to meet our commitment to substantially recover revenue by the end of the second quarter,” commented John T.C. Lee, President and CEO. “Thanks to the dedication, hard work, and ingenuity of our 10,000-plus employees, we are a stronger and more resilient company today than we have ever been.”

Lee added, “Amid macro and end market-driven softness entering the second quarter, we are making excellent progress integrating Atotech [acquired in July, 2021], which positions MKS to capitalize on a number of attractive long-term opportunities with our portfolio of foundational solutions across the

semiconductor, electronics and packaging, and specialty industrial markets.”

“We executed well in ramping factory utilization as we emerged from the ransomware incident, which, combined with prudent cost control, allowed us to

deliver positive free cash flow in the first quarter, despite the unusual challenges we faced,” said Seth H. Bagshaw, Executive Vice President and CFO.

Bagshaw added, “Moving forward, we are focused on resuming strong free cash flow generation, realizing acquisition synergies and executing our disciplined strategy of de-levering our balance sheet.”

Second quarter 2023 outlook

The company says it is expecting for the second quarter of 2023, “revenue of \$980 million (+/- \$50 million); adjusted pre-tax earnings (EBITDA) of \$223 million (+/- \$27 million); and non-GAAP net earnings per diluted share of \$1.13 (+/- \$0.29).

<https://optics.org/news/14/4/54>



MKS last year launched the “Talon”; a >70 W green pulsed laser designed for micromachining. The Spectra Physics-developed Talon enables high-throughput manufacturing for clean energy and e-mobility industries.

Selected GAAP and Non-GAAP Financial Measures (In millions, except per share data)			
	Q1 2023	Q4 2022	Q1 2022
Net Revenues			
Semiconductor	\$ 309	\$ 503	\$ 488
Electronics and Packaging	222	266	60
Specialty Industrial	263	316	194
Total net revenues	\$ 794	\$ 1,085	\$ 742
GAAP Financial Measures			
Gross margin	42.2%	44.7%	45.0%
Operating margin	0.1%	15.0%	23.1%
Net (loss) income	\$ (42)	\$ 54	\$ 143
Diluted (loss) earnings per share	\$ (0.64)	\$ 0.81	\$ 2.57
Non-GAAP Financial Measures			
Gross margin	42.2%	45.9%	45.0%
Operating margin	12.1%	23.6%	25.6%
Net earnings	\$ 32	\$ 133	\$ 151
Diluted earnings per share	\$ 0.48	\$ 2.00	\$ 2.71

Latest revenues and margins reveal stress of February’s ransomware attack on MKS.

Nuburu ships blue lasers for industrial additive project

Multiple units' delivered to partner Essentium to be used in additive manufacturing systems suitable for making metal parts.

Nuburu, the blue industrial laser pioneer that listed on the NYSE's American Stock Market earlier this year, says it has delivered the first lasers for a new additive manufacturing (AM) system designed to produce metal components.

The lasers have been procured by Nuburu's partner Essentium, under a "multi-year, multi-million" contract agreed by the two US-based firms a year ago.

Texas-headquartered Essentium plans to integrate the blue lasers within its "high-speed extrusion" (HSE) system to create a wire-fed metal 3D printing solution - initially for product development, with manufacturing applications expected to follow.

When they announced the agreement last year, Nuburu and Essentium said that the new additive platform would be designed to couple high throughput

with extremely high part quality. They envisage broad-scale use across automotive, aerospace, and defense markets.

Blue advantages

News of the shipments follows Essentium's launch of a "parts-on-demand" service in March, with the firm's CTO and co-founder Elisa Teipel saying:

"Nuburu's unparalleled expertise and leadership in blue laser technology have been instrumental in advancing our cutting-edge 3D printing platform. The arrival of the latest units this year and our partnership with Nuburu will help us continue to drive innovation in the AM industry."

Blue wavelengths are more readily absorbed by metals - particularly colored material like gold, copper, and related alloys - meaning that shifting from the near-infrared lines produced by

conventional sources ought to deliver a significant increase in speed and efficiency. Other advantages include a smaller spot size, and high-brightness emission.

In their most recent investor presentation, the Nuburu executive team led by CEO Mark Zediker suggested that AM systems based around blue lasers would be able to print much larger parts than conventional systems, and to produce them seven times faster with much lower energy usage.

DLP combination

Earlier this month the firm said it had delivered another of its blue lasers, also for an additive system, for a research project supported by the US Air Force.

The aim of that effort is to combine the absorption advantages of the blue laser with the ability to project an image onto the powder bed using a digital light projector (DLP) component from Texas Instruments - an approach expected to dramatically increase the speed of 3D printing of metal parts.

"The speed increase is the result of using an image that is up to 30,000 times larger than the single spot used today while delivering the same resolution as today's printers," explained the firm.

"This 3D printing architecture can be scaled to enable high-density materials to be printed at speeds of 100 [times] or greater, while dramatically reducing CO2 emissions."

The latest developments come shortly after Colorado-based Nuburu revealed that it made an operating loss of \$5.3 million on sales of \$0.5 million in the opening quarter of 2023 - and a balance sheet indicating only \$1.5 million in cash and equivalent liquid assets at the end of March.

"We had a very impactful first quarter of 2023," commented Zediker. "We have seen continued forward progress in our key markets of welding, 3D printing and defense.

"In particular, our work with the US Air Force and our ongoing partnerships underscore the building momentum in our commercial pipeline."

<https://optics.org/news/14/5/38>



Photo: Essentium.

A high-speed 3D printing system from Essentium. This system was used to produce biocompatible prosthetic devices - the Texas-based company is now partnering with blue laser developer Nuburu to deliver a 3D printing solution for producing metal parts.

Jenoptik posts 'solid start' to fiscal year 2023

Reports revenue growth of 12.2 percent and improved profitability.



Image: Jenoptik.

Jenoptik is investing more than 70 million euros in new and state-of-the-art production facility for micro-optics and sensors. Discover more about the construction project and its progress, about the groundbreaking ceremony and the future design of the high-tech manufacturing facility. Construction work on the Jenoptik Group's new high-tech fab at Dresden Airport Park began on September 6, 2022.

Reporting its first quarter (Q1) of fiscal 2023 financial results, diversified photonics group Jenoptik says it has continued on its course of growth, with Q1 revenue up by 12.2 percent to 234.1 million euros (prior year equivalent: 208.5 million euros). This growth was primarily due to sustained strong demand in the Advanced Photonic Solutions division.

Stefan Traeger, President & CEO of Jenoptik, commented, "With double-digit growth in revenue and earnings, Jenoptik delivered a solid start to the fiscal year 2023. Our Advanced Photonic Solutions division, in particular, continues to show strong momentum, as expected.

"Mainly in view of a healthy order backlog, we are optimistic for the remainder of the fiscal year, pursuing the objectives of optimally using our existing capacities while simultaneously expanding them."

The company posted its strongest revenue growth in Asia/Pacific, with a rise of 31.4 percent, followed by Europe (including Germany) with 12.9 percent. Overall, 74.0 percent of revenue was generated abroad (prior year: 76.4 percent).

Pre-tax earnings ("EBITDA") again grew at a faster rate than revenue, mainly due to strong performance in the Advanced Photonic Solutions division and the improvement in earnings of the Non-Photonic Portfolio Companies. At 36.6 million euros it was 74.2 percent up on the prior-year figure of 21.0 million euros. The EBITDA margin was 15.6 percent (prior year: 10.1 percent). With depreciation and amortization virtually unchanged, group EBIT came to 19.9 million euros, compared with 4.7 million euros in the same period in the prior year. At 11.8 million euros, group earnings after tax were also significantly higher than the prior year's figure of 2.8 million euros, despite higher interest and tax expenses. Earnings per share amounted to 0.21 euros (prior year: 0.05 euros).

Capacities to be increased

As had been forecast, the group's order intake of 283.0 million euros in the past quarter was down on the high prior-year figure of 310.3 million euros. Due to the still high book-to-bill ratio of 1.21, the order backlog further increased to 776.1 million euros (31/12/2022: 733.7 million euros).

Jenoptik continues to expand its production capacities in response to strong demand, primarily through the construction of a new fab in Dresden, Germany, for the semiconductor equipment industry, a new site for the medical technology business in Berlin, as well as machinery and equipment. Accordingly, at 22.5 million euros, capital expenditure in this quarter was higher than the prior year's figure of 20.5 million euros.

The free cash flow before interest and taxes increased mainly driven by higher earnings from minus 3.1 million euros in the prior-year quarter to 28.5 million euros.

Division performances

The Advanced Photonic Solutions division saw continued dynamic growth, with revenue increasing by 15.1 percent from 158.0 million euros to 181.8 million euros. Business with the semiconductor equipment industry, in particular, but also in the areas of Industrial Solutions and Biophotonics, saw revenue increases in the first three months of 2023.

The Smart Mobility Solutions division posted revenue growth of 8.4 percent in the first quarter of 2023, to 22.9 million euros (prior year: 21.2 million euros). Due to product mix effects, the EBITDA margin came to minus 0.4 percent, compared with 3.2 percent in the prior year. In the first three months of 2023, the division posted an order intake worth 38.9 million euros, on a par with the prior-year figure.

At 28.3 million euros, revenue of the Non-Photonic Portfolio Companies was close to the prior year's level of 28.8 million euros. Driven by higher earnings of Prodomax and the elimination of negative impacts from Interob, EBITDA amounted to 3.2 million euros, compared with minus 2.2 million euros in the same period of the prior year.


In view of good business performance in the first quarter, Jenoptik's Executive confirmed its guidance for the full year 2023. The group therefore continues to expect revenue of between 1,050 and 1,100 million euros and an EBITDA margin of 19.0 to 19.5 percent.

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IBM to build its first European quantum data center

Facility in Ehningen, Germany, set to open in 2024; to serve “expanding ecosystem”.

On June 6, IBM announced plans to open its first Europe-based quantum data center to facilitate access to cutting-edge quantum computing for companies, research institutions and government agencies. The data center is expected to be operational in 2024, with multiple IBM quantum computing systems, each with “utility scale quantum processors”, meaning those of more than 100 qubits.

The data center will be located at IBM’s facility in Ehningen, Germany, and will serve as IBM Quantum’s European cloud region. Users in Europe and elsewhere in the world will be able to provision services at the data center for their cloud-based quantum computing research and exploratory activity.

The data center is being designed to help clients continue to manage their European data regulation requirements, including processing all job data within EU borders. The facility will be IBM’s second quantum data center and quantum cloud region, after the first was opened in Poughkeepsie, New York, in January, 2019.

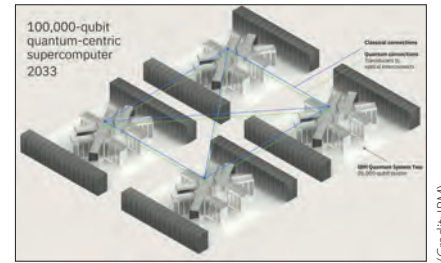
“Europe has some of the world’s most advanced users of quantum computers, and interest is only accelerating with the era of utility scale quantum processors,” said Jay Gambetta, IBM Fellow and Vice President of

IBM Quantum. “The planned quantum data center and associated cloud region will give European users a new option as they seek to tap the power of quantum computing in an effort to solve some of the world’s most challenging problems.”

Ana Paula Assis, IBM General Manager for EMEA, added, “Our quantum data center in Europe is an integral piece of our global endeavor. It will provide new opportunities for our clients to collaborate side-by-side with our scientists in Europe, as well as their own clients, as they explore how best to apply quantum in their industry.”

The IBM Quantum Network currently has more than 60 organizations across Europe accessing quantum hardware and software via the cloud, including Bosch; Deutsches Elektronen-Synchrotron; the European Organization for Nuclear Research (CERN); and Fraunhofer-Gesellschaft.

Dr. Raoul Klingner, Director Research at Fraunhofer-Gesellschaft, commented, “We are happy and proud to support the IBM Quantum team’s decision to set up their European quantum data center in Ehningen. The choice of location in the state of Baden-Württemberg will further strengthen the ecosystem that Fraunhofer has built with customers and partners from industry and research.”



Visual rendering of IBM Quantum’s 100,000-qubit quantum-centric supercomputer, expected to be deployed by 2033.

(Credit: IBM)

IBM’s \$100M plan to develop ‘100,000 Qubit’ supercomputer

In May, 2023 – while attending the G7 Summit in Japan – IBM announced a 10-year, \$100 million initiative with the University of Tokyo and the University of Chicago to develop a quantum-centric supercomputer powered by 100,000 qubits.

At the time, IBM said “a 100,000-qubit system would serve as a foundation to address some of the world’s most pressing problems that even the most advanced supercomputers of today may never be able to solve.”

For example, such a powerful quantum system could unlock new understandings of chemical reactions and the dynamics of molecular processes. In turn, this could enable researchers to help study climate change through modeling better methods to capture carbon; discover materials to build batteries for electric vehicles and energy grids towards the goal of being cleaner and more sustainable; and uncover more effective and energy-efficient fertilizers.

IBM stated that it intends to expand on the new the Tokyo and Chicago partnerships to include Argonne National Laboratory and Fermilab National Accelerator Laboratory. It commented, “These two laboratories offer capabilities and expertise that can facilitate delivering the technologies envisaged in the race to build a quantum-centric supercomputer.”

Arvind Krishna, Chairman and CEO, IBM, said, “We have achieved significant progress along our roadmap and mission to globally establish useful quantum technology, so much so that we can now, with our partners, truly begin to explore and develop a new class of supercomputing anchored by quantum.”

<https://optics.org/news/14/6/16>



(Credit: IBM)

IBM Quantum System Two, visually rendered here, is a system designed to be modular and flexible, combining multiple processors into a single system with communication links.

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