the business of photonics

optics.org product focus

LASER World of PHOTONICS
2013 Edition

Welcome to the LASER World of Photonics **Product Focus** brought to you by **optics.org**.

We bring to you some of the latest products launching at the show as well as some of the latest editorial coverage found on the **optics.org** website. In this issue we look at the potential dangers of green laser pointers: NIST: 90% of green laser pointers flout safety regulations *(see page 8)*. And review Alfalight's decision to become fabless and focus on defence and aerospace applications.

We have included booth numbers *(where available)* making it easy for you to check out the products for yourself.

For the full articles, and daily updates on developments in the wider photonics business, visit **optics.org**.

We're publishing further issues of **optics.org Product Focus**, the next being for **Optics+Photonics and Photonics West 2014**.

To ensure that your product is included, contact **optics.org** as soon as possible as space will be limited.

TRIOPTICS GmbH

Visit us at Booth No. B2.307

OptiCentric® Cementing: High Precision Optical Alignment and Cementing

OptiCentric® Cementing: Highest efficiency in the production of lens systems is reached when the single production steps are optimally matched with each other. To make the optics manufacturers production more efficient TRIOPTICS developed the OptiCentric® Cementing Station. The cementing process works fully automatically and allows the operator to prepare the lenses while the OptiCentric® instrument aligns and cements the lenses to each other.

OptiCentric® Cementing can be optimized for different clamping methods used during the ensuing edge centering process.

When the lenses are fixed during the turning process using the bell clamping method the prior cementing process works as follows: The lower lens is fixed by vacuum or collet chuck and the top lens is centered with respect to the optical axis of the lower lens, but not to some third mechanical reference. Hence the whole cementing procedure is independent from the accuracy of any mechanical fixtures.

Secondly OptiCentric® Cementing Station can be adapted for the cementing of lenses onto a centering arbor. Therefor, OptiCentric® Cementing is equipped with a high precision chuck in which the arbor is clamped during the cementing process. The lenses are aligned with respect to the axis of the arbor and then clamped into the chuck of the turning machine for further processing.

Both methods achieve a residual centration error between both lenses in the doublet of typically less than 2 microns.

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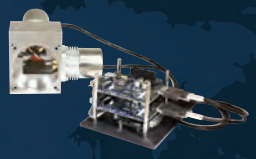

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ID Quantique SA

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Single photon detection module - visible range (350 - 900nm)

The id100 series offers compact and affordable single-photon counting modules with best-in-class timing resolution (40ps) and low dead time (45ns).

The id100 has excellent timing stability up to count rates of 20MHz. Based on a reliable silicon avalanche photodiode sensitive in the visible spectral range, the module is able to detect weak optical signals down to the single photon level.

Available in two different free-space versions (20um and 50um) or in three different fiber coupled versions (SMF20, MMF50 or MMF100).

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AdlOptica GmbH

Visit us at Booth No. C1.643

Collimating beam shaper πShaper® for fiber and fiber-coupled lasers

New collimating beam shapers **πShaper® NA 0.1_12 / NA 0.2_12** from AdlOptica GmbH are intended to operate with high power TEM00 and multimode fiber lasers as well as fiber-coupled DPSS and diode lasers, combining functions of beam shaping and collimation. Divergent beam with Gaussian or similar profile from a TEM00 and multimode fiber is converted, with nearly 100% efficiency, to collimated (low divergent) beam with flattop (uniform) intensity distribution. Thus, incredible efficiency of laser energy utilization is achieved, a HAZ (Heat Affected Zone) is eliminated, as a whole, laser technologies become more reliable and results of material processing are more stable and predictable.

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InGaAs/InP photon counter at 100MHz trigger rate and free-running

The id210 Advanced System for Single Photon Detection is a major breakthrough for detection at telecom wavelengths, i.e. 1310nm and 1550nm.

Its performance in high-speed gating at internal or external frequencies up to 100MHz by far surpasses the performance of existing detectors.

It can also operate in free-running mode. Photons can be detected with probability up to 25% at 1550nm, while maintaining the dark count rate at low levels.

A timing resolution as low as 200ps can be achieved.

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Carl Zeiss Jena GmbH

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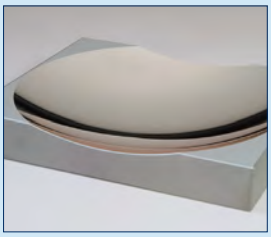
Freeform elements

Freeform elements give the optics designer the freedom to design products with outstanding properties.

Often projects fail when they are to be implemented due to the necessity for high quality. We at Carl Zeiss provide the excellent quality you need for your projects to succeed.

Carl Zeiss Jena GmbH is your partner for prototyping and serial production of high precision freeform elements made from materials such as metal, glass and crystalline materials.



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ID Quantique SA

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Free-running near-Infrared Photon Counter with very low dark count rate

The cost-effective id220-FR-SMF offers the lowest dark count rate for single photon detection in free-running mode at telecom wavelengths.

The cooled InGaAs/InP avalanche photodiode and associated electronics have been specially designed for achieving low afterpulsing rates in free-running mode. The singlemode or multimode fiber coupled modules can operate at detection probability levels of 10%, 15% and 20% with an adjustable deadtime between 1us and 25us, both parameters are adjustable via the USB interface. The timing resolution is as low as 250ps at 20% efficiency.

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Carl Zeiss Microscopy GmbH

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CGS UV-NIR

If you want to measure with maximum quality and optimum efficiency, the CGS UV-NIR from Carl Zeiss is the right solution for you.

The compact grating spectrometer CGS UV-NIR are a class all its own. Extremely compact and rugged design with variable detector (CCD or PDA) options allow users to measure with maximum quality and optimum spectral efficiency.

The CGS spectrometer family completes the product lines of the MMS, MCS and PGS spectrometer modules. Depending of the application, different variations of the CGS are available.

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MÖLLER-WEDEL OPTICAL GmbH

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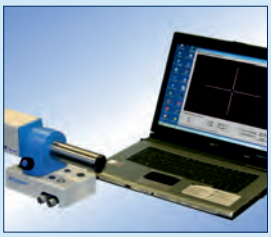
Catch the angle!

MÖLLER-WEDEL OPTICAL's well-known electronic autocollimators of ELCOMAT series measuring angles were extended by the ELCOMAT direct series.

These electronic autocollimators are available with different focal lengths and objective tube diameters.

Sophisticated hard- and software solutions enable to evaluate multiple autocollimation images.

Moreover, these autocollimators can be used in combination with a Collimator direct for measurement of deflection angle in transmission, or by using additional attachment achromats as a sensor for centration measurement.



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Diamond SA

Visit us at Booth No. B1.462

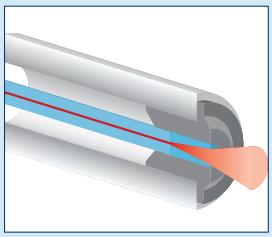
PSf technology to avoid Fiber Optic burning

The PSf technology reduces the power density at the glass-air interface by splicing a rod of pure silica on the SM or PM fiber termination.

Particle(s) burning at the glass-air interface are the first cause of failure for high power SM and PM connectors. This occurs at around 0.3 MW/cm2 power density and particles with 1um diameter.

DIAMOND offers PSf optical interface typically for high power free space applications at the injection or at the output at various wavelengths.

The PSf technology can be used with the following connector types: E-2000™, F-3000™, DMI, FC, SC, AVIM, Mini-AVIM, or other ferrule assemblies upon request.



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MÖLLER-WEDEL OPTICAL GmbH

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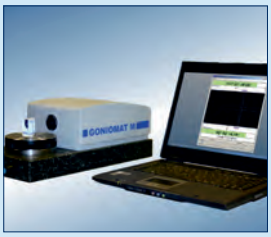
Measuring Micro-Prisms has never been this easy!

MÖLLER-WEDEL OPTICAL's well-known GONIOMAT series goniometers measure angles of pinhead sized prisms. Due to special enhancements to the illumination hardware and the control software the dynamic range has been increased drastically and allows for detecting uncoated surfaces with sizes down to 0.5 mm^2. For easy adjustment of small prism's surfaces into the detection range of the autocollimation sensor the goniometers can be extended with a tiltable measuring table and a LASER alignment aid for a time-saving and convenient measuring process. Other features of the GONIOMAT are its unique, computer-based ray tracing analysis of the measurement data for verification, determination of refractive indices and measurement of deflection angles.



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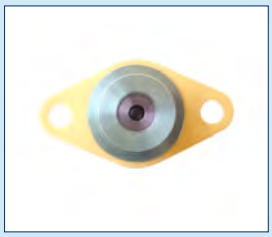
nanoplus GmbH

Visit us at Booth No. B1.671

ICLs: NEW nanoplus launches DFB lasers from 3 – 6 µm

The new mono mode lasers can be operated continuous wave at room temperature with low power consumption. The attractive mid-infrared region between 3 – 6 µm contains some of the most fundamental molecular absorption features of hydrocarbons and other industrially relevant gases. Their absorption strengths in the 3 – 6 µm range are often several orders of magnitude higher than those in other spectral regions. Due to the low power consumption of the laser source, battery-operated hand-held devices allowing high-accuracy spectroscopic absorption measurements are now within reach for many innovative applications in this wavelength range.



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MÖLLER-WEDEL OPTICAL GmbH

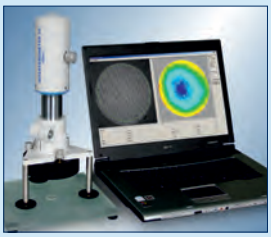
Visit us at Booth No. B2.327

Interferometry at its finest

The new INTERFEROMETER VI-direct represents a cost effective alternative to conventional interferometers. Equipped with a high resolution camera, which allows for 5x digital zooming, the Interferometer VI-direct is capable of flatness and sphericity measurements as well as for determining wavefront deformation in the nanometer range.

Due to short exposure times the interferometer is highly insensitive to vibrations. Furthermore its compact design makes it well suitable for the integration in application specific workstations.

For easy evaluation of all data by the included INTOMATIK software, the system features a direct USB connection to the PC.



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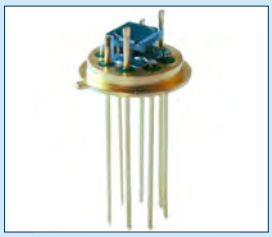
nanoplus GmbH

Visit us at Booth No. B1.671

Photodiodes: NEW Photodiodes from 1.0 – 2.6 µm

nanoplus now also offers optimized photo detectors for their DFB lasers. They are especially suited for sensing applications. The InGaAsSb based photodiodes are applicable for detection in the wavelength range from 1000 nm to 2600 nm. With their large photosensitive active diameters of 1, 2 or 3 mm they are specifically designed for high performance gas sensing, process and environmental control, analytical instruments as well as for OEM-products of all kinds.



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Sponsored Editorial

Optikos Releasing Time-Saving Additions to its *OpTest*™ Metrology Line

Optikos Corporation is the world's largest manufacturer of equipment for the measurement of optical image quality. For nearly 30 years, Optikos has been a recognized leader in the fields of optical and electro-optical testing.

In 2013, Optikos released a new object generator product and announced plans to release a significant update to their *OpTest*™ software. The OG-1000 series is an entirely new instrument, using state of the art light sources, optics, electronic controls, and automation. This product generates reference objects such as slits and pinholes that are back-illuminated with high intensity light from visible to long wave infrared wavelengths (400nm to 16µm).

While the OG-1000 series may be used as a stand-alone object generator in a wide range of applications, the design was primarily driven by a desire to improve MTF testing throughput and performance. A single integrated product now replaces the company's earlier illuminators for visible and infrared wavebands together with the optional chopper wheel and motorized target wheel accessories.

The new product has substantially greater radiometric output in all wavebands, thereby improving the signal available when testing lenses. In order to virtually eliminate the need to install new targets when testing a new lens, the number of precision aperture targets has been doubled from 8 to 16. A significant feature of the new source is the capability to remotely switch between co-aligned visible and infrared wavebands without requiring user interaction with the source. A color touchscreen display is standard in the OG-1000 series so that the instrument may be controlled either locally through this interface, or remotely through the *OpTest*™ software or by user software using a comprehensive set of serial commands.

When testing infrared optics, a substantial amount of time may be spent setting up lenses and preparing them for measurement. Alignment of the lens to the axis of the optical test system is usually achieved by autocollimation off of a reference plane mirror held against a lens datum. Whereas this technique had previously required interchanging infrared and visible sources during setup and testing, the OG-1000 series has significantly improved the ease-of use and throughput that may be expected from an *OpTest*™ bench by making this a one-button operation. The integrated target wheel is remarkably fast, taking less than two seconds to access any of the 16 target positions.

Careful design of the illumination optics and the use of an all-reflective relay in the infrared channel has dramatically improved the spectral and radiometric output. This produces higher signal levels across every waveband, but particularly in the shortwave and longwave infrared. These are difficult regions for MTF testing, and improved signal means more accurate and repeatable test results, particularly for slow or poorly corrected lenses. Sources are controlled by a microcontroller using linear power amplifiers and are ramped in a manner that maximizes the expected lifetime. When they do need replacing, pre-aligned source modules are available that eliminates the need for user-alignment, thereby minimizing downtime.

A software controlled chopper wheel which can be stopped in the open position is included in models that are intended for use in infrared test benches, and an optional motorized filter wheel is also available. All models include an internal shutter which enables automatic background correction for visible testing or video infrared testing. This results in faster MTF results and improved accuracy for poorly-corrected lenses.

In the summer of 2013, Optikos will be releasing for their *LensCheck*™ metrology system a completely new version of their optical analysis software, *OpTest*™*7*. While drawing on a proud history of lens metrology software, *OpTest*™*7* is an entirely new software package that presents the user with a fresh and intuitive interface written using the very latest Windows programming technologies to realize a distributed system architecture. Different interface levels may be selected depending on the sophistication of the operator and the nature of the metrology task. In Engineering Mode, the full software functionality is made available to the operator; in Lab Mode, the measurement of many first order parameters such as focal length, distortion, and field curvature can be carried out with minimal configuration; and in Production Mode an entire test sequence may be executed using a single button.

Although *OpTest*™*7* software will eventually run all of the Optikos *OpTest*™ test benches, the initial release is targeted at the company's turnkey *LensCheck*™ Systems. Besides featuring an intuitive user interface, the new software features optimized data presentation, embedded lens test routines, customizable test configuration set-ups, multiple user access modes for users of all levels of technical expertise, and controls all *LensCheck*™ system hardware including an accessory shutter for automatic background corrections.

The *OpTest*™*7* application automates several of the tasks that the operator had previously been required to perform. Examples include intelligent data acquisition window sizing and the optimization of camera exposure times. Whereas the measurement of certain lens parameters had previously been realized through an auxiliary "macro" program, the new software incorporates a variety of automatic lens testing procedures and implements a fast test mode to enable simultaneously measurements of multiple parameters (e.g. focal length, distortion, field curvature) at each field point. The test results are available in formatted Microsoft® Excel Spreadsheets. Optikos will be shipping *OpTest*™*7* with all new *LensCheck*™ Systems and expects to begin offering upgrades of this game-changing software package to their installed customer base in the summer of 2013.

Laser-export Co. Ltd.

Visit us at Booth No. B1.169/2

Compact high-energy TECHNOLOGY-series Q-switched lasers for OEM

Laser-compact group introduces a new series of unique actively Q-switched DPSS lasers (brand name – **'TECHNOLOGY'**) for industrial applications, which offers four different lines:

Specific – with the highest pulse energy: up to 2mJ at 1053nm and up to 1mJ at 527nm;

Express – with the highest peak power: up to 300kW at 1053nm and up to 250kW at 527nm;

Advanced – with the highest average power at 4kHz repetition rate

and *Basic* line – with low power consumption and economic price. 263, 351, 527 and 1053nm wavelengths are available.

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CILAS

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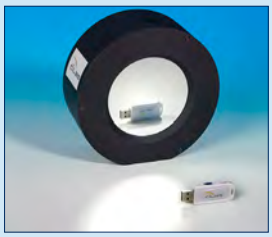
Pioneers in Lasers and Adaptive Optics

As a pioneer in Lasers and Adaptive Optics, CILAS developed a wide range of Deformable Mirrors using the "Piezo Array" technology for wavefront correction, for astronomy, space, and laser applications.

"Monomorph" mirrors allow the correction of the optical aberrations induced in a high power laser chain, while avoiding both "print through" effect and energy distribution modulations.

Standard Monomorph Mirrors are available for Diameters 30mm up to 85mm; and are supplied with their Electronic Driver.

Larger diameters as well as specific electrode patterns are available upon request.



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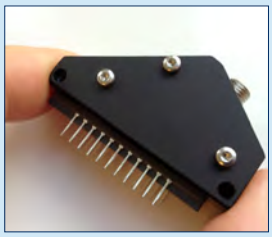
Ibsen Photonics

Visit us at Booth No. B2.547

New Ultra Compact OEM Spectrometers and Transmission Gratings

FREEDOM spectrometers combine compactness with high performance and are the ideal OEM solution for portable systems where performance cannot be sacrificed. Our spectrometers are perfect for analytical instrument integrators because of the flexibility in choice of detector and electronics, as well as a robust and thermally stable operation.

Ibsen's Fused Silica Transmission Gratings provide high efficiency, high dispersion and highest power/energy handling - ideal for high power applications. Grating types include pulse compression/beam combining gratings, telecom gratings for ROADM/WSS, spectrometer gratings, and Phase Masks.



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EKSMA OPTICS

Visit us at Booth No. B1.553

BBO Pockels Cells for Q-switching and pulse picking in high power lasers

As a latest product EKSMA OPTICS introduced new BBO Pockels Cells capable to operate with high power lasers at repetition rates up to 1 MHz.

EKSMA OPTICS BBO Pockels cells feature robust and compact design.

Electro-optical crystals are installed in to sealed dry cells. The choice full open aperture cells or cells protected with ceramic apertures is available.

Typical applications are Q-switching, pulse selection/picking, CW beam chopping, laser cavity dumping and coupling light into and from regenerative amplifiers.

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CINOGY Technologies GmbH

Visit us at Booth No. B2.370

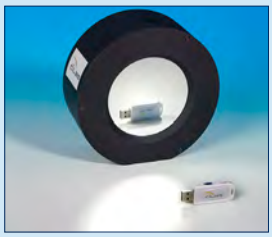
First Compact USB3.0 Laser Beam Profiler

The successful CinCam CMOS models have been extended by the high-performance Nano series.

This new CinCam CMOS Nano based on modern, high-resolution 1.3MPixel / 4.2MPixel CMOS sensor combined with high-speed USB 3.0 interface.

The ultra-compact design enables maximum flexibility and requires minimum space.

Unique analytical capabilities and incomparable visualization modes open up new opportunities in laser beam analysis according to ISO standards.



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Arden Photonics Ltd

Visit us at Booth No. B1.163

BQM-50 Beam Propagation Analyzer

Arden Photonics introduces their new compact BQM-50 Beam Propagation Analyzer. Easy to align and adjust, measures in under 20 seconds, measures M^2, wavelength range 400 – 1100nm. NPL technology applied.

The BQM-50 is designed to allow complete measurement laser beam propagation characteristics. In this system, a liquid lens, which can vary its optical power in response to a changing input voltage, is used to remove the need for a movement stage, required to allow beam widths to be sampled as the stage moves through the laser caustic. This makes the BQM-50 one of the most compact and capable beam quality systems available.The clear, simple to use software gives complete control over the measurement which can be aligned and completed in a few minutes.

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NIST: 90% of green laser pointers flout safety regulations

First precision measurements on large sample of pointers shows "unacceptable" light levels.

Low-cost apparatus designed by National Institute of Standards and Technology (NIST) researchers to quickly and accurately measure the properties of handheld laser devices has shown that nearly 90 percent of green pointers and 44 percent of red pointers tested were out of compliance with federal safety regulations.

Photo courtesy of NIST

NIST's Joshua Hadler, who designed the simple and low-cost laser pointer test apparatus.

Green pointers, which rely on frequency-doubling optics, also emitted "unacceptable" levels of infrared light, reported the team led by NIST Laser Safety Officer Joshua Hadler. It also found one pointer delivering more than ten times the allowable output power in the visible region.

Reporting the results of its study on 122 pointers at the International Laser Safety Conference taking place in Orlando, Florida, this week, NIST says that the apparatus has been deliberately designed to be replicated easily by other institutions.

While anecdotal reports of green laser hazards have previously appeared in scientific journals and the media, NIST says its tests are the first reported precision measurements of a large number of handheld laser devices.

The tests also showed, unexpectedly, that many red laser pointers are also out of compliance with federal rules as defined by the Code of Federal Regulations (CFR). "Our results raise numerous safety questions regarding laser pointers and their use," the team's paper states.

Ten-times legal limit

NIST conducted its tests on a random selection of commercial lasers that had been labeled as either Class IIIa or 3R and sold as suitable for demonstration use in classrooms and other public spaces.

Under the CFR rules, those lasers are limited to a maximum output power of 5 mW in the visible region, and less than 2 mW in the infrared. "About half of the devices tested emitted power levels at least twice the CFR limit at one or more wavelengths," said NIST. "The highest measured power output was 66.5 mW, more than ten times the legal limit." The power measurements are said to be accurate to within 5%.

According to the American National Standards Institute (ANSI), any laser devices that exceed the 3R limits may be hazardous and should be subject to more rigorous controls such as training, to prevent injury – and should be more appropriately labeled as either Class 3B or Class 4.

ANSI rules define a Class 3R laser as "potentially hazardous", though only if the eye is focused on the beam and stable. Class 4 lasers are defined as being a hazard to the eye from the direct beam, while a Class 3B source "may be hazardous under direct and specular reflection viewing conditions".

$2000 test setup

To carry out the tests, the technical team from NIST's Laser Radiometry Project built a laser pointer test bed in collaboration with the NIST Office of Safety, Health and Environment. The team has provided its data on laser pointer power measurements to the US Food and Drug Administration (FDA), the authority that regulates laser product safety.

In addition to the excess power, NIST found that more than three-quarters of the green lasers also flouted ANSI rules saying that infrared light should be contained within the laser housing, and were shown to emit infrared light beyond the CFR limit.

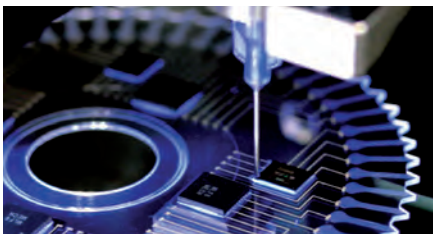
The relatively simple test system designed by Hadler consists of a laser power meter and two optical filters to quantify emissions in the visible and infrared range. The power meter and filters were calibrated at NIST. Lens holders ensure repeatable laser alignment, and an adjustable aperture contains the laser light around the output end of the laser.

"The measurement system is designed so that anyone can build it using off-the-shelf parts for about $2,000," Hadler says. "By relying on manufacturers' traceability to a national measurement institute such as NIST, someone could use this design to accurately measure power from a laser pointer."

Sponsored Editorial

Photonics-based components and multi-µ-functional devices

Optical device manufacture requires command of interdisciplinary microfabrication.



CDA GmbH (Suhl, Germany) is a specialist manufacturer of optical components and solutions in plastic for photonics-based applications. CDA also provides their customers with access to several high-end technologies for the development and manufacture of complex miniature devices incorporating printable electronics components and microfluidic channels.

Optical elements

Optical elements can be designed with spherical, aspherical or even non-rotationally-symmetric freeform surfaces, and arranged in any 2D array desired. Each individual element can comprise refractive structures exhibiting diffraction-limited performance, or binary/multi-level diffractive structures optimized to provide the best efficiency for the intended application. Both types ensure optimal optical performance in a broad range of real-world applications.

The primary intended uses for these components are for general illumination tasks, for example as diffusors or for improving efficiency in light emission from (3D) displays and OLED panels. Further applications include imaging systems for multi-channel cameras or for improving the effective fill factor of CMOS image sensors, or as projection optics for LED, VCSEL and fiber arrays.

While silicon and glass remain important material options, the vast majority of applications are served exceptionally well by various types of plastics, such as polycarbonate, PMMA and cyclo-olefin-copolymers. These materials provide all of the performance aspects required in most applications, but are lighter, lend themselves to high volume replication via injection molding, and are more cost efficient.

Application diversity through added functionality

CDA is additionally a champion of more complex devices that integrate several functions on a single chip. So-called ›lab-on-a-chip‹ and other compact but sophisticated and sensitive devices are becoming increasingly important, for example, where physical chemistry, electrical and/or optical properties need to be tested on a small scale. Appropriate devices lend themselves well to high levels of parallelization, bringing cost reductions into a design but their manufacture does require a fully integrated process chain and command of several cutting-edge microfabrication technologies.

The manufacture in plastic means producing highly complex and functional microstructures with extreme precision, and doing so very cost efficiently under mass production conditions. The CDA approach is so attractive because of the number of available process steps and due to the nature of the functionalities – optical, electronic, microfluidic – that can be combined freely so as to optimize the performance of a device for the intended application. Finally, coatings can enhance specific optical performance or induce other specific physical properties, such as hydrophilic or hydrophobic behaviour.

According to Pia Harju, Business Development Manager at CDA, "We believe the market for both micro-optical elements and for integrated devices is absolutely global and we are targeting a range of industries including machine vision, lighting, medical devices, environmental applications and food production."

CDA µFunctional Solutions

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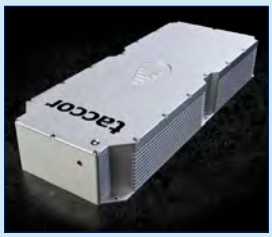

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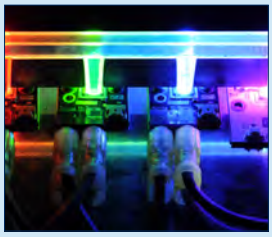

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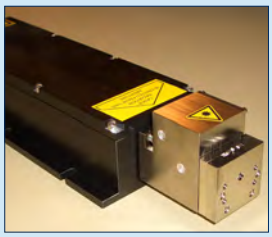

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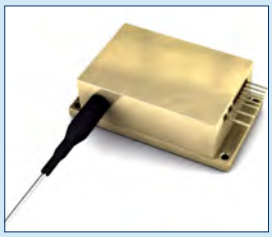

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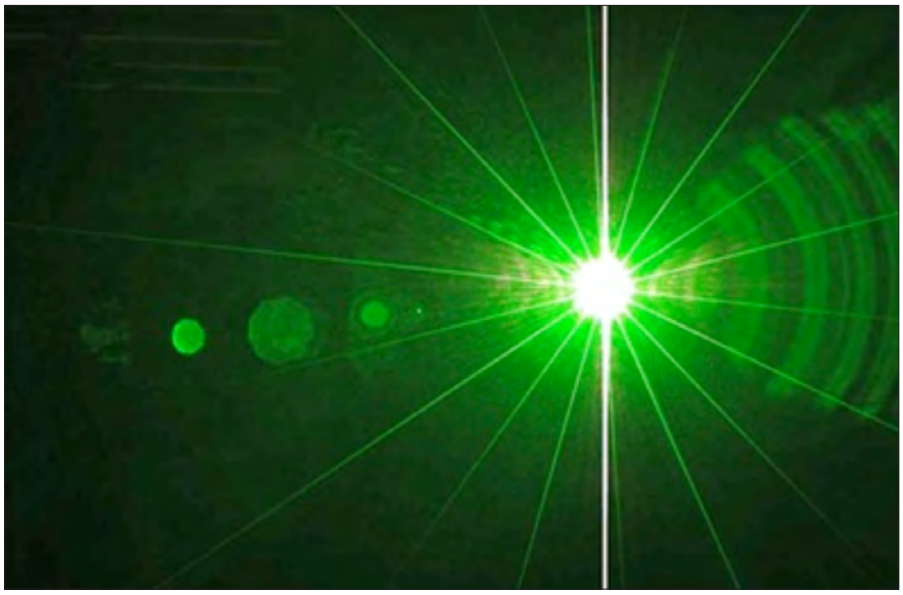
Alfalight goes fabless to focus on defense

Aluminum-free laser diode specialist sells manufacturing assets to laser microprojector developer Compound Photonics.

Alfalight, the venture-backed Madison, Wisconsin, maker of laser diodes, has sold its semiconductor manufacturing assets and commercial product lines to Compound Photonics, which will use the technology in its laser projection "light engines" for mobile devices.

Under the terms of the deal, Alfalight will now focus on defense and aerospace applications, to develop and make ruggedized component and system-level solutions for its customers operating in those sectors.



Credit: Alfalight.

Alfalight's "non-lethal optical disruptor", based on a frequency-doubled Nd:YAG laser.

Compound Photonics, based out of a former Motorola semiconductor facility in Phoenix, Arizona, will continue to make products for Alfalight's commercial customers, while the two companies say that they will also cooperate strategically at the component level.

"This transaction enables Alfalight to increase [its] investment in the development and production of laser-based solutions for defense, aerospace, and related high-performance applications," said Mohan Warrior, president and CEO of Alfalight. "With a fabless model, [we] can better expand our engineering capabilities and align our system manufacturing infrastructure for the challenging requirements of this market."

Jonathan Sachs, the CEO of Compound Photonics – which was co-founded by semiconductor device pioneer Jerry Woodall – commented: "Adding Alfalight's highly efficient and wavelength-stabilized diode laser components to our technology portfolio strengthens our position as a vertically integrated projection light engine manufacturer."

"We look forward to continuing to supply Alfalight's commercial customers with products they have come to rely upon, as well as delivering new, high-performance photonics components for their next-generation systems."

As part of the transaction, the two companies have signed an agreement to ensure that Alfalight retains a supply of high-performance laser components, for applications including laser-based visible and infrared illumination, laser-initiated ordnance, targeting, tracking, and locating, and so-called "eye-safe non-lethal ocular disruptors" – that is, lasers used to dazzle rather than destroy the enemy.

Vertical integration

Compound Photonics, which believes that the deal will help to simplify the emerging "pico-projector" supply chain for mobile device manufacturers, is developing high-definition and ultra HD 4K projection light engines for smartphones, tablets and other consumer electronics hardware.

The firm's integrated systems include the display, laser illumination sources, mirrors, optics, drive electronics, software and housing, and the Alfalight deal increases vertical integration and gives the firm greater control over the supply of critical laser components. "This keeps costs low and simplifies the supply chain and integration process so manufacturing can scale to the huge volumes required for rapidly growing global mobile device markets," the company says.

The addition of Alfalight's high-efficiency laser diode technology, which has been developed over more than a decade, brings together the scientific and engineering teams and manufacturing capabilities from both companies. Alfalight was one of the firms funded through DARPA's "SHEDS" project that increased laser diode efficiencies to dramatic effect ten years ago.

The aluminum-free active region designs, which gave the company its name, also offer very high reliability and are protected by a strong patent portfolio.

Initially focused on telecoms applications, and subsequently backed by ARCH Venture Partners, KPL Ventures and CenterPoint Ventures, two years ago Alfalight attracted investment from In-Q-Tel, the "venture wing" of the US Central Intelligence Agency (CIA).

One of the defense-related products it has been working on is a high-power but non-lethal green laser that can be used to dazzle enemies - technology that could be adapted for display projection applications.

Article by Mike Hatcher, Editor in Chief of optics.org

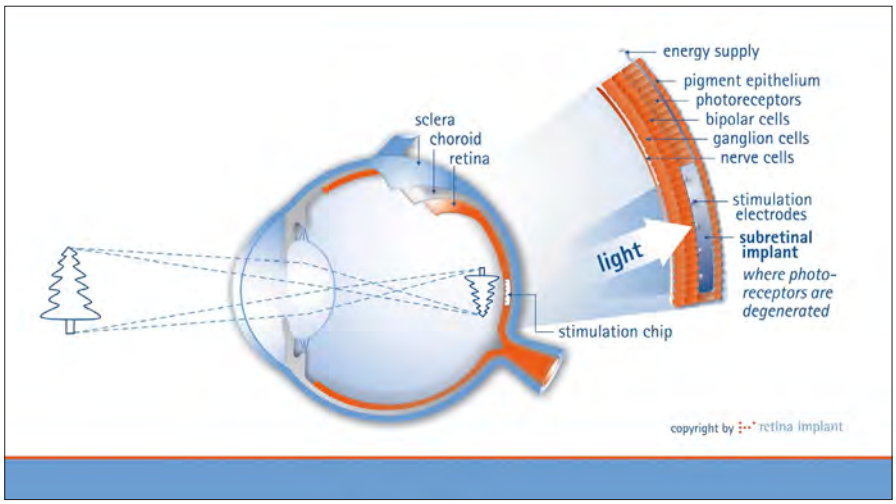
Implants offer hope in fight against retinitis pigmentosa

Different approaches by Second Sight and Retina Implant show the progress made in combating the condition.

The disease retinitis pigmentosa (RP) includes a number of subtly different vision disorders, thought to ultimately arise from an inherited retinal degeneration.

For sufferers, the consequences of the condition can be drastic: cells in the retina fail to function properly, often starting with peripheral rod cells and progressing to the central cone cells, and progressive sight loss results.

Although the condition is at present incurable, advances in the field of retinal implants demonstrate the progress now being made in combating the condition and restoring a measure of sight to those afflicted.



Two developers of implants tackling the problem have recently announced significant progress.

Subretina Implant

In February 2013 Retina Implant, based in Germany, announced results from the first stage of a multi-center clinical study into the use of its subretinal implants as a treatment for RP. The study was published in in the journal Proceedings of The Royal Society B.

The trial found that during the course of a three to nine month observation period, functional vision was restored in the majority of nine German patients implanted with the company's Alpha IMS microchip. This represented part of the first module of the Company's second human clinical trial.

Visual acuity for two of the patients surpassed the visual resolution of patients from the company's first human clinical trial, according to the company.

"Alpha IMS is a subretinal implant, placed below the retina in the macular region," Walter-G. Wrobel, CEO of Retina Implant, told optics.org. "This approach leverages the natural movement of the eye to capture and interpret images, unlike other approaches to retinal implant technology which use an externally-worn camera to process images."

The implant is positioned at the level of the photoreceptor cells in the retina, from where it can directly stimulate other retinal cells and make full use of those inner and middle retinal layers that remain correctly functioning.

In use, light-sensitive diodes in the 3 mm x 3 mm x 70 um microchip respond to incoming light and pass a current into the underlying retinal cells. Wrobel commented that "our device has 1,500 electrodes, which is the largest number of any other implant currently in clinical trial."

The system requires an external power supply to function, and the patient alters perceptual parameters such as brightness and contrast by adjusting the power unit. "The human eye is much more light sensitive than any camera chip, therefore an external power supply is used to amplify the electrical signals from the chip," noted Wrobel.

At present the Alpha IMS implant is intended only for the treatment of RP, although Retina Implant has indicated that it may eventually be tested against other conditions, such as macular degeneration.

"While we believe there is potential in the future for other degenerative eye conditions, we are currently focused only on RP and on bringing this technology to market for patients with late-stage RP who could benefit from it," confirmed Wrobel. "Ours is the first and only subretinal implant in clinical trials, and performance and usability set new standards for retinal prostheses. Recognition of daily-life objects, and reading of letters and words, was first demonstrated with our device."

Alongside the implant's undoubted success, the clinical trial also reported some potential stability problems affecting certain patients fitted with Alpha IMS. Wrobel indicated that Retina Implant has tackled these issues through changes to the design and procedures used, and that the company continues to focus on performance and reliability enhancements.

"We have been working intensely on solving these issues, and have made a lot of progress in the laboratory," he said. "These improvements are currently confidential and proprietary, but we are confident that we have solved these problems."

Epiretinal Implant

California-based Second Sight is taking an alternative approach to tackling RP, and has developed the Argus II system based around an epiretinal implant.

As well as the implant itself, the Argus II system includes an antenna, an electronics case, and an electrode array, along with external equipment including glasses, a video processing unit and a connecting cable. Visual information is first captured by the external camera and supplied to a portable computer for conversion into electrical stimulation. From there it is sent to the array on the retina.

The complete Argus II retinal prosthesis system received approval from the US Food and Drug Administration in February 2013 for the treatment of individuals with late stage retinitis pigmentosa, having already received the equivalent European approval in 2011.

The epiretinal implant is placed in the inner surface of the retina, from where it directly stimulates the innermost ganglion cells and bypasses the retina's other layers.

"In RP a specific layer of the retina, the one formed by photoreceptors, is predominantly affected," commented Maura Arsiero of Second Sight. "Once the cells in this layer start perishing, the successive layers of the retina also go through a modification - a 'rewiring'"

This can present a problem in subsequent stimulation of a retina affected by RP, according to Second Sight. The information may not be transported correctly to the brain, or stimulation at a certain desired point might fail to induce the intended vision.

Argus II is intended to solve this issue by bypassing the damaged photoreceptors, and instead stimulating the still-healthy ganglions which transmit the visual information along the optic nerve. "With an epiretinal implant you bypass all this 'rewired' area, stimulating the ganglional cells that are the output layer of the retina directly and forwarding the info to the brain cortex," said Arsiero.

Clinical trials using the Argus II have focused on RP and on choroideremia, a retinal degenerative condition that affects the choroid layer of the eye. Arsiero commented that "The current approval indicates that this treatment is designed to address RP, although in the future we will probably investigate the use of this device with other diseases."

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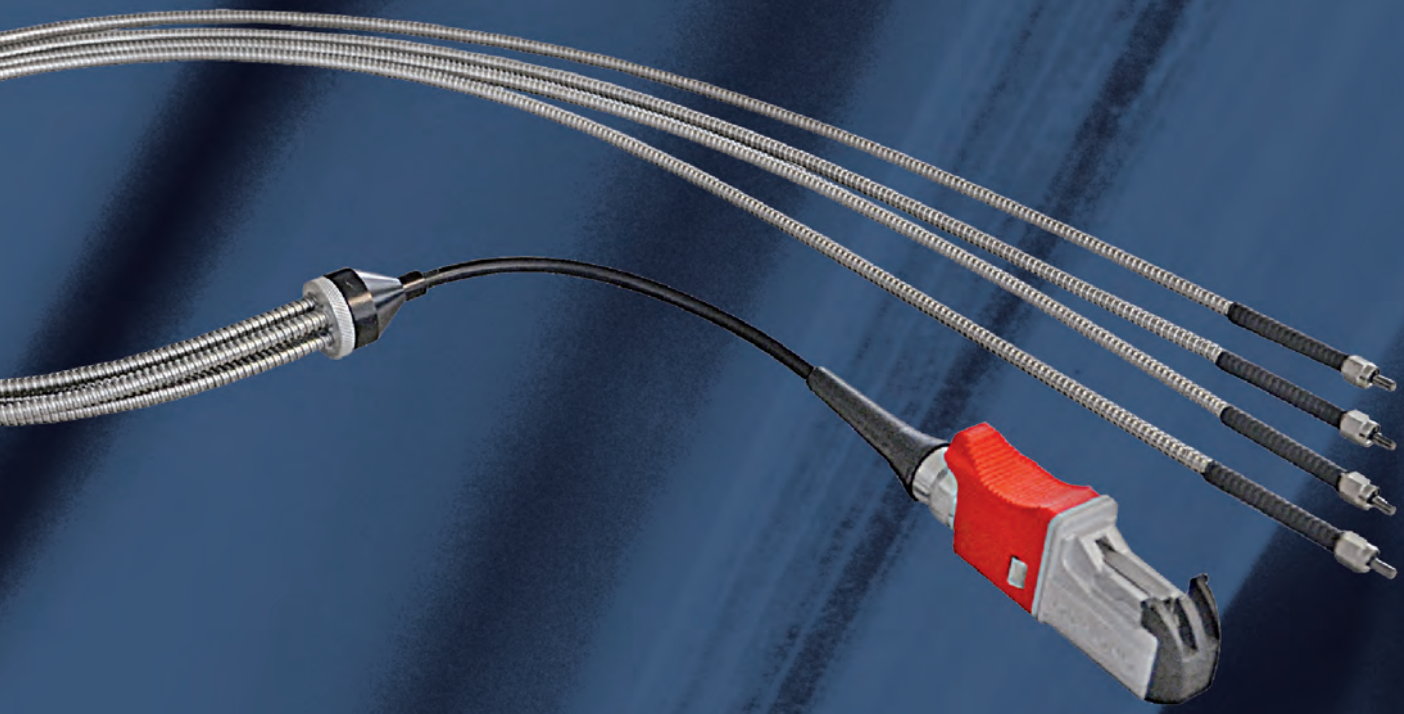

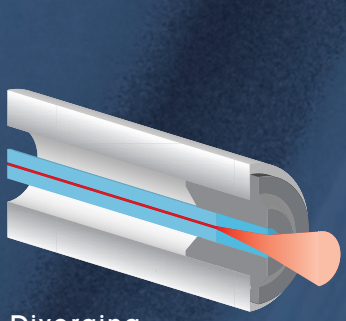

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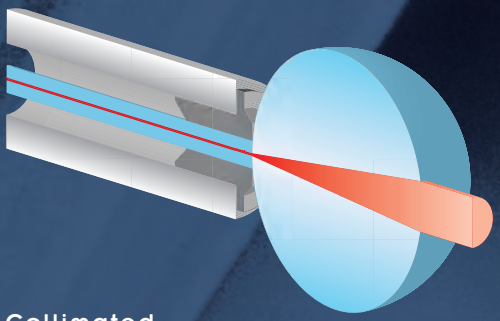

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