PHOTONICS NEWS

Company Newspaper of the LASER COMPONENTS Nordic AB

lasercomponents.se
#04 ▪ 04|16

Blue laser diodes for automotive lighting

Comparison: 520 nm laser diodes and 532 nm DPSS lasers

New Products

Red, Blue, Green

Dear Reader,

When you read this, Easter has just passed and hopefully spring is in the air. The first quarter of this year passed quickly, with a lot of activities for LASER COMPONENTS. One of the most important ones was Photonics West 2016. Every year, representatives from the photonics industry, including all eight LASER COMPONENTS branch offices, meet in San Francisco for an intensive exchange of information. We have over 200 employees worldwide, and thirty-five of us met to discuss the future direction of the company and the development of new products and technologies.
Company know-how has expanded rapidly in the past few years. It is one of our expressed goals to further bundle existing strengths. A closer look at ongoing development projects has shown us quite plainly how diversified our product range is, more than almost any other company in our industry: glass processing, thin-film technology, mechanical design, optics design, semiconductor technology for laser diodes and photodiodes, fiber optic assemblies – all of these products are not only developed but also manufactured within the LASER COMPONENTS Group. The combination of these technologies offers great potential in the development of novel products. Taking advantage of this potential requires not only the technical know-how but also sound cross-cultural collaboration that ensures fun and motivates at the same time.

This Photonics News Nordic edition that you hold in your hand is dedicated to one of our most important products: the laser diode! It was mass markets that enabled the expensive developments in laser diode technology. This is not really a market of ours: We offer laser diodes for quite different niche applications in the forefront of technology. To find out more, please keep reading.

The next trade show coming up is the Scandinavian Electronics Event 2016 in Kista, Sweden. The S.E.E. 2016 is an arena for innovative electronic solutions, inspiring meetings and business making. The event is arranged by The Swedish Electronics Trade Association and Stockholmsmässan at the venue of Kistamässan. Meet us there for more information on company and product news!

Yours,

Mikael Winters

Content

Market News

Production Facilities

Company

New Products

LASER COMPONENTS

Imprint

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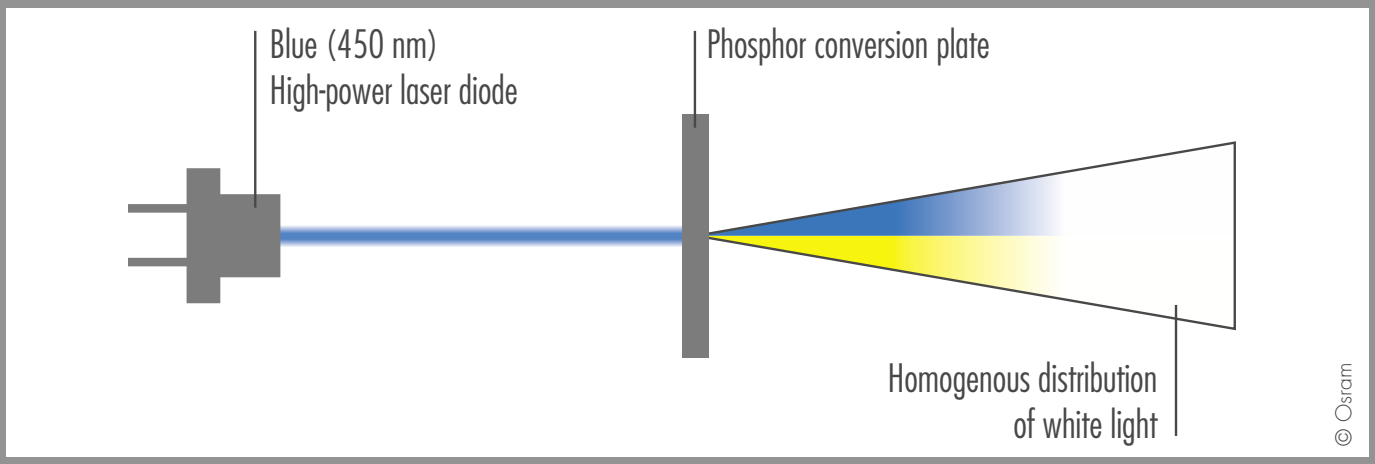
OSRAM Develops Laser Diodes for Automotive Lighting

Blue laser light is already being used on the road

Ralf Hying, OSRAM. Car fans are fascinated and designers love the new creative possibilities. For lighting technicians, laser light represents a welcome new source of light. But what is behind this technology? Two misconceptions are widespread in connection with laser light. The first is that the purpose of a laser beam is to illuminate the road. And second, this fuels the fear that highly concentrated light is dangerous. However, this is incorrect and the fear unfounded. Although a blue laser is involved, a laser beam does not leave the headlight. ➔

WEB N04-243

Car Headlight Functional Principle: Transmissive conversion approach



Laser Light – How Does it Work?

The operating principle of automotive lighting is different. Inside the headlight, the laser beam hits a phosphor and excites it to light up – resulting in a so-called "conversion" of the laser light. This principle is comparable to the conversion of a classic fluorescent lamp or a white LED. In a fluorescent lamp, UV light is converted into visible light; in the LED, blue light is converted. Fluorescent materials are also referred to as "phosphors". The pure element phosphorus is not involved; rather, the fluorescent materials used are high-performance ceramic materials which may contain phosphorus compounds. Together with a carrier material, the fluorescent materials are processed into partially transparent sheets. In addition to geometry, the material selection, processing, and optical characteristics of the converter unit are decisive for the performance and, therefore, the subject of development.
The second misconception of laser light concerns the amount of light. The development was not set in motion because existing light sources do not produce enough luminous flux but to utilize light sources of unprecedented luminance. Developers are able to pick from a sufficient number of other conventional light sources that generate very high luminous flux. For more than 20 years, for example, gas discharge technology (in the form of xenon headlights in cars) has been used.

Lots of Light from Tiny Headlights

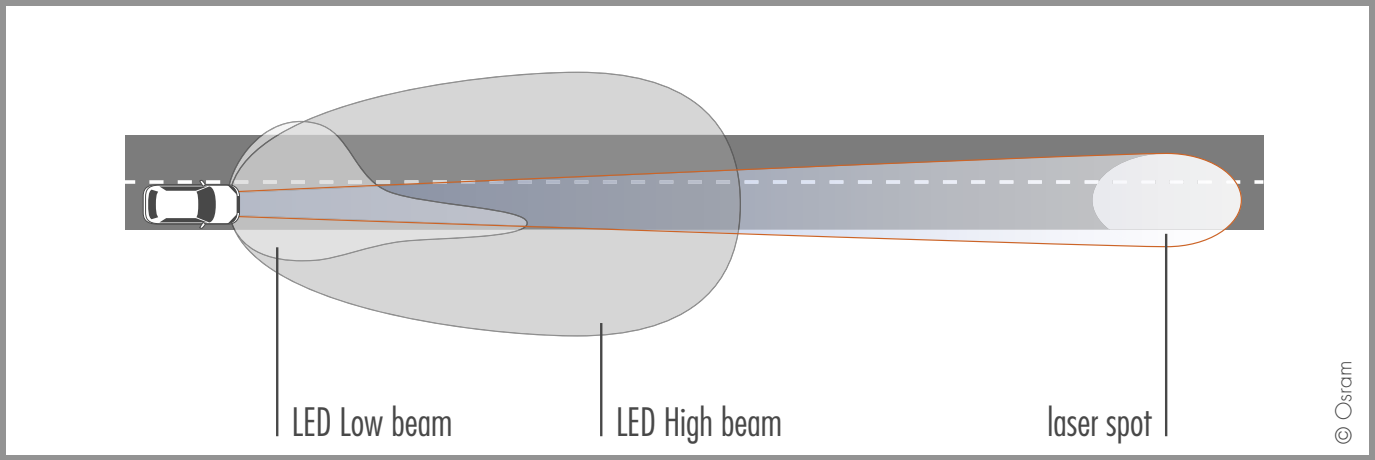
The advantage of laser light is that it allows you to produce a lot of light that is exactly guided from very compact headlights. An example may illustrate this concept: A common halogen high-beam headlight with a light intensity of about 100,000 candelas (cd) has a diameter of ca. 220 millimeters. For a comparable amount of light, laser technology requires only 30 millimeters.

Hybrid Lighting Concepts

The first vehicles with laser light are already being used on the road. Car manufacturers rely on hybrid lighting concepts: LEDs are used for the main lighting function; an additional high beam (which only switches on at higher speeds) can be implemented using laser light technology.

This new technology is expected to be implemented in the future in a similar way; that is, in combination with established light sources. Each lighting concept will be able to contribute its particular features, and a wide variety of combinations is conceivable. In addition to LEDs, xenon, and lasers in the headlights, OLEDs will be implemented in taillights in the future. Car manufacturers will use lasers, LEDs, and OLEDs particularly for design purposes but also to emphasize their technical aspirations and their innovative spirit. From a lighting perspective, laser light sources provide a significantly higher luminance than all light sources previously established in the automobile. For this reason, laser light may be regarded as the specialist for high-beam functions. Furthermore, it can become the illumination of choice wherever high light output is desired from very small footprints, as well as light exit surfaces that are just as small. However, the engineers at Osram think even further. They already envision application scenarios inside the vehicle, for example laser projectors that replace existing displays.

Car Headlight: Lasers light range



Design Advantages of Fiber Optics

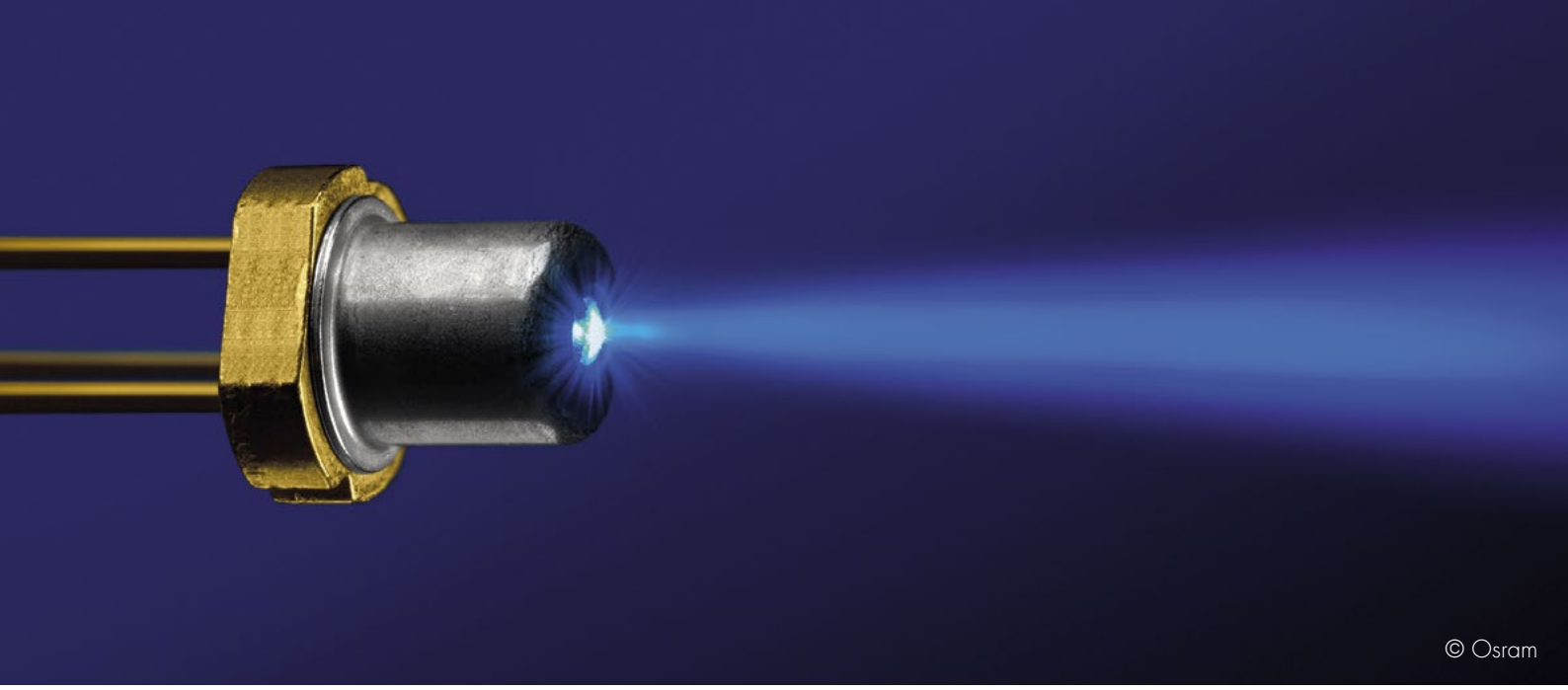
Another advantage of laser light is that the actual light source (i.e., the laser diodes) does not necessarily have to be located inside the headlight. Connected to an optical fiber, they can be placed pretty much anywhere inside the car. This makes the technology particularly interesting especially if there is only very little installation space available inside the engine compartment.

Innovative Light Technology from Decades of Expertise

In 2006, Osram began to develop suitable laser diodes. The first prototypes were based on indium-gallium-nitride compounds. When the subject of laser light became a topic for the automotive industry, Osram merged two previously separate technologies: the laser and the converter. The latter refers to the initially described fluorescent material which turns the laser into useful light. Osram possesses many years of experience in both areas. For almost 40 years, Osram Opto Semiconductors has developed and produced both LEDs and semiconductor lasers.

At the Regensburg production facility, InGaN-based LEDs have been manufactured since 1996. The knowledge gained from blue LEDs has sig nificantly benefited the development of the blue laser.

One special challenge was the increase in efficiency of blue light. For physical reasons, laser diodes for red and infrared wavelengths convert the input energy better than what is possible at the other end of the light spectrum – the blue region. Therefore, blue laser diodes produce more waste heat that must be dissipated by appropriate cooling measures. In 2013, Osram was able to increase the efficiency for blue laser diodes in the watt-output range to 30 percent and thus reduce the need for cooling. ➔



A Challenging Environment: The Automotive Industry

A lot of effort was required to adapt the laser diodes to the automotive environment. The requirements of operation and car manufacturers are high. For example, headlights (and thus the laser diodes) have to work in a temperature range from -40 to +80 degrees. Likewise, high humidity must not pose a problem. The tests, in which both laser diodes and entire light modules must prove their resistance to strong vibrations, are also very complicated. Such stress is unknown in consumer electronics where a much lower temperature range is common. This difference is evident, for example, when a smartphone attached to the windshield stops operating in hot weather and sunshine while the car electronics naturally continue to work.

In fulfilling these requirements, Osram has benefited from the experience gathered as world leader in the automotive sector for other lighting products, such as xenon or semiconductor-based technologies. This includes laser diodes for application in distance measurement in driver assistance systems. However, these lasers have much less power and operate in the infrared spectrum. A diode possessing the laser class required for laser light had never before been employed in a car and under such – relatively extreme – environmental conditions.

In addition to the technological challenges, obstacles for series production of laser light include safety and approval matters. Several security systems are installed to ensure that during normal operation, laser light is not able to exit the headlight and cause damage, for example, to the human eye.

The systems are designed so that after the headlight has been damaged (e.g., after an accident) the laser is switched off immediately.
Hardly any part of the car is as heavily regulated as the lights. The characteristics of the headlight must meet existing ECE regulations. Thus, a maximum level of 200,000 candelas applies for high beams. Therefore, higher glare values than other headlights need not be feared. Laser light is supposed to increase security and not endanger other road users. ■

Ralf Hying, has a graduate degree in electrical engineering and has worked at Osram since 2005. As program manager, he has been responsible for the entire field of laser applications since 2011.

Blue Laser Diodes

In 2013 Osram Opto Semiconductors introduced blue laser diodes that have an efficiency of 30% onto the market. At a wavelength of 450 nm, versions with an optical output power of up to 50 W are currently available. The PLPM4 450 model holds 18 – 20 multi-mode laser chips in a butterfly housing. They are used for illumination tasks and in laser projection. Laser diodes were developed in the cyan-colored wavelength of 488 nm for biomedical, medical, and measurement technology. They have an output power of 60 mW and are suited for both pulsed and cw operation. ■

WEB N04-043

About Rods and Cone Cells

How to Distinguish Color Nuances: The Physiology of Seeing Color

The eye is responsible for the creation of images. To put it simply: light enters the eye through the cornea, is bundled by the pupil, and lands on the retina. The retina is covered by two types of photoreceptors: rods and cones.

Rods Bring Light to Darkness

More than one hundred million rods are responsible for our perception of light. They cannot distinguish color; in fact, if we only had rods, we would only see the world in black and white.

Cone Cells: No Light, No Color

In the back of the retina is the macula through which the visual axis runs. There are three types of cones surrounding this spot that are responsible for distinguishing color: blue, green, and red receptors (S, M, and L cones). Similar to additive color mixture, different color images are sent to the brain with the help of cones; together with the brightness information of the rods, the world becomes a colorful place.
The darker the surroundings, the more the rods control perception. Color cannot be distinguished at night.

Bright Is Not Always Bright – The V(λ) Curve

The spectral sensitivity of the human eye depends on the wavelength: We perceive some colors brighter and some darker than others.
This dependence is represented by the empirically determined brightness sensitivity or V(λ) curve. Accordingly, the highest sensitivity is at the wavelength of 555 nm (i.e., in the green color range). A green light source appears brighter than a red light source when both give off the same energy flux (see the eye's brightness sensitivity curve on pg. 009). ■

Better FLEXPOINT® Laser Modules with Green Laser Diodes?

Our experts have done a comparison: 520 nm laser diodes and 532 nm DPSS lasers.

It's here! – The directly-emitting, semiconductor-based green laser diode can be integrated into our FLEXPOINT® laser modules as an alternative to miniature DPSS lasers. Our production team and our laser module sales team leader, Jochen Maier, are available to discuss what exactly has changed with the directly-emitting diodes. We offer a comparison between the 532 nm diode-pumped solid-state (DPSS) lasers and the 520 nm laser diodes, as well as personal experience reports provided by our experts!

For many years, we have been integrating small DPSS lasers into the FLEXPOINT® laser modules at LASER COMPONENTS. In the beginning, we fought with thermal problems and power stability; nowadays, DPSS technology is very stable and used in many industrial and medical applications.

Further questions? Our experts Svante Karlsson and Mikael Winters

Green: The brightest thing we have to offer the human eye!

Green light is perceived as the brightest light by the human eye! Thus, it makes sense that green lasers be used for applications in which the laser beam is meant to be observed by the naked eye. Using green cross-hairs and lines, we can position machines or parts; green dots show the doctor where the processing laser hits human tissue; in material processing, they show where material will be welded or separated.
Color sensitivity differs from person to person; however on a basic level, the 532 nm wavelength of the DPSS laser is perceived as a full and powerful green. The laser diodes currently available have a wavelength of 520 nm (i.e., a light blue streak that is perceived as colder).

Beam profile: Striking differences

If you continue to compare both technologies, the most striking differences can be found in the beam profile: Due to the underlying physics, the DPSS laser produces a uniform, round beam with a Gaussian-shaped power distribution and an M^2 value of nearly 1.0. The semiconductor laser with its layer structure, however, emits an elliptical beam at a ratio of approximately 1:3. It is suited for making lines, and together with diffractive optical elements can generate diverse patterns. The DPSS laser remains the first choice for dot lasers – especially in the medical field.

Temperature range: Ice cold to hot

The first miniature DPSS lasers to enter the market had a very limited temperature range: values typically ranged between 10°C and 30°C or between 15°C and 40°C. The versions that are currently available range from -5°C to +50°C!
Laser diodes remain undefeated in our comparison:
Up to a power level of 50 mW, the 520 nm diodes offer a consistent operating temperature range of -20°C to +60°C. The operating temperature applies to the laser source. If it is integrated into a housing, the additional heat produced in the housing must also be taken into consideration.

Power stability: Dependent upon heat generation

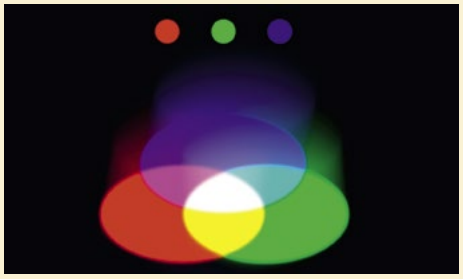
Heat generation significantly affects the power stability of the lasers: Miniature DPSS lasers are extremely temperature sensitive. With complex electronics, we are successful in stabilizing our FLEXPOINT® DPSS modules to power fluctuations of <5%. This requires DPSS lasers that are equipped with an additional photodiode by the manufacturer. This allows us to implement an effective control circuit to stabilize the optical power. Power stabilization is unproblematic in modules with a directly-emitting laser diode: Monitoring diodes are integrated on a standard basis. In combination with the digital laser control developed by us, we can achieve power fluctuations of <2%.

Modulation behavior and Q-switch phenomenon

The digital modulation behavior and the analog power adjustment of miniature DPSS lasers are limited by the so-called Q-switch phenomenon: This is disruptive noise with very high peak intensities in the frequency range of 200 kHz to 2 MHz. In addition, another mode in the DPSS laser can develop, which results in a second output beam. This undesired effect occurs often at low power levels and, therefore, affects dimmable lasers.

High-Tech in Everyday Life – Will Green Laser Diodes Revolutionize the World?

First red, then blue, and now green. It is light (specifically: the light of laser diodes) which makes the world smarter. The first success stories involving green laser diodes reached the market in 2009. A research group from the Japanese company Sumitomo Electric Industries developed a "real green laser diode" based on GaN [1]: the efficiency was low but the enthusiasm high. Osram Opto Semiconductors continued this success and won the Beckurt's Award for 515 nm laser diodes with optical power levels of 50 mW [2], which have been available commercially since 2012.



Light Mixtures – How Colors Are Created

With the primary valences of red, green, and blue, (almost) any other light color can be created. This is referred to as an additive mixture in the RGB color space. White light is created by mixing all three colors at the same intensity. Yellow can be created, for example, by mixing red and green light at the same intensity.

The human eye distinguishes color as soon as light shines on an object. Depending on the object, part of the light is reflected (returned) while the other part is absorbed (swallowed). SSI projectors are based on these two principles: light mixture and surface projection. SSI stands for solid state illumination (i.e., for semiconductor-based light sources).

The Future Market of Miniature Projectors

There is a large market for miniature projectors: Used in the projection of (moving) images from smartphones and head-up displays, they will soon become an indispensable part of everyday life. The demands placed on projectors for the mass market are great: they have to be small and consume low amounts of power.

LED or Laser Diode? It's the Small Differences

The light in LEDs and laser diodes is produced in a similar way, and the colors are similar; however, the properties are completely different.

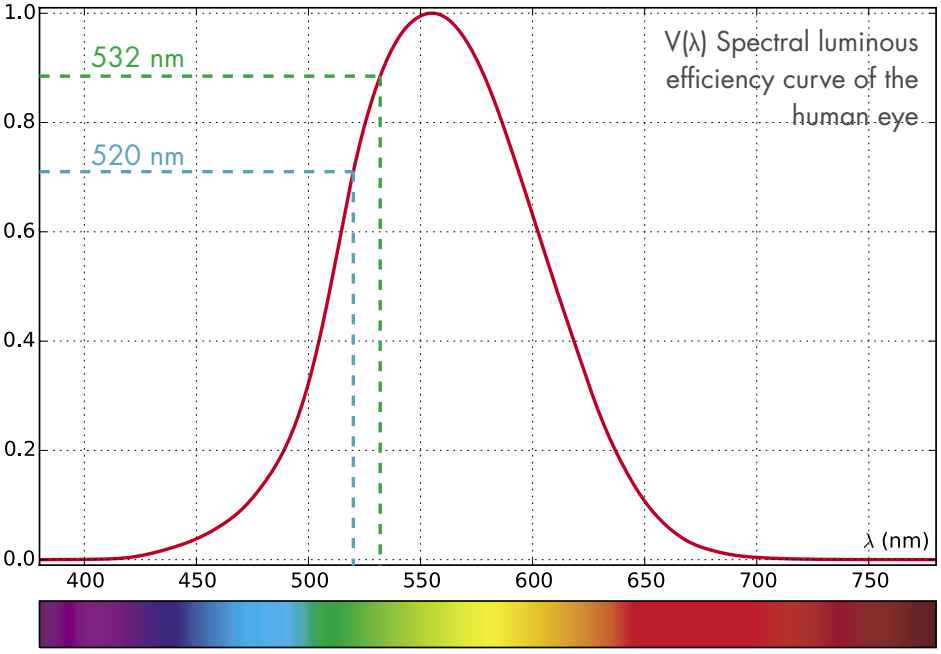
The main difference between these technologies is the emission behavior of the light sources. LEDs have a divergent emission (i.e., originating from the source in a cone shape). The light of laser diodes, however, is directed, and the beam is narrow.

An image projected using laser diodes is, therefore, always sharp – on both flat and curved surfaces [3]. Furthermore, projectors with laser diodes can be built that are even smaller than LED versions [4]. ■

[1] Heise Online Newsticker, „Erstmals echte grüne Laserdiode", 29.07.2009
[2] Osram Opto Semiconductors, Pressemeldungen, 10.12.2010
[3] Photonikforschung, „Pikoprojekte auf dem Vormarsch", 09.04.2013
[4] PICOLO - Förderinitiative „Optische Komponenten und Systeme für Volumenmärkte"

Both disruptive effects are very temperature dependent and often not reproducible. The maximum modulation frequencies of FLEXPOINT® DPSS laser modules are, therefore, limited to a few kHz and in some cases to less than 1 kHz.

Laser diodes of 520 nm do not exhibit the Q-switch phenomenon and can be modulated with >100 MHz depending on the control electronics. In simple laser modules, modulation frequencies with several hundred kHz to 2 MHz are common.



Dimensions: When size matters

If space is limited, you require laser diodes: The smallest available 520 nm laser diodes fit into a TO housing with a diameter of only 3.8 mm. The entire module, including control electronics, therefore, fits into a housing that has a diameter of 11.5 mm. It is possible to further miniaturize this module to just 6 mm! The housing length depends on the desired beam profile and the extent of the electronic controls.
The miniature DPSS lasers are largely available with a diameter of 10 mm or 12 mm. A few special versions have a reduced diameter of 5.6 mm.
The housing length of DPSS lasers will always be larger than versions with a laser diode due to their complex design and the required beam shaping.

Output power

Laser diodes of 520 nm are currently available with an output power of up to 80 mW. Miniature DPSS lasers can achieve up to several hundred milliwatts.

Plummeting costs

The price of 520 nm laser diodes has been rapidly dropping since their market introduction. They are already less expensive than DPSS lasers with an output power of >10 mW.
It can be assumed that the cost of green-emitting laser diodes will very soon match the cost of red-emitting laser diodes. Due to the electronic controls, which are much easier to handle than in DPSS lasers, the green laser diode is already the more cost-effective alternative.

Conclusion

Green laser diodes have been rapidly expanding and will dominate many areas of projection technology; nevertheless, the 532 nm DPSS lasers will remain the first choice in some applications. In particular, when the beam profile has priority, the DPSS laser can make the most of its advantages. If housing size, temperature, power stability, modulation behavior, or price is of particular importance, then green laser diodes are used. ■

DOEs for Changing the Beam Profile

Diffractive optics for changing the beam profile are now also available, specifically adjusted to green wavelengths.

WEB N04-074

	DPSS Module	Laser Diode
Wavelength	532 nm	520 nm
Beam profile	Gaussian beam	Elliptical - nearly 3:1
Operation temperature	-5 °C to 50 °C	-20 °C to 60 °C
Output power stability	< 5%	< 2%
Modulation frequency	< 1 kHz	> 100 MHz available
Output power, max.	>100 mW	80 mW

Our New Green Products

Green laser diodes are “en vogue” – at least that is to what the previous pages would attest. We will be introducing new products, all of which have one thing in common: green laser diodes from our partner Osram Opto Semiconductor.

Hard But Precious

Should your laser module be able to withstand falling into water? Or maybe you even plan to use it in a sandstorm?

WEB N04-174

On land, in water, or in the air: the area of application of lasers is unlimited; however, their operational capability is generally not. To prevent the laser from taking damage as a result of its environment, we placed it in a housing that can withstand all conditions. Thanks to the IP67 protective class, this module not only withstands sandstorms, it can also go into one-meter-deep water for up to thirty minutes. Because it is so robust, we have decided to call it heavy-duty (i.e., the HD module).

HD modules are available as dot lasers, line lasers with fan angles from 10° to 100°, or cross-hair lasers with fan angles from 2° to 60°: for targeting, marking, or positioning tasks in absolutely any conceivable environment. The focusing settings allow optimal adjustment for any distance, which allows any line to stand out clearly and concisely against the background.

Both a waterproof M12 power connection and a voltage supply of up to 30 VDC are, of course, part of the package. This leads to an unproblematic connection thereof to any machine or switch box. For independent operation, the module can be connected to a rechargeable battery on an optional basis.This all-around talent is now also available with 520 nm green laser light.

Thus, the lines and cross-hairs are easily visible even in daylight. The major advantage of green light is apparent on black surfaces, such as, for example, car tires; red laser light is largely absorbed on such surfaces. However, green light stands out brightly and clearly – all at a power that is classified as eye safe. ■

That Was Photonics West 2016

SPIE. PHOTONICS WEST

Record Number of Visitors in San Francisco – NOX Rocks the Convention Halls

Were you there, too? If not, then we would have to say that you definitely missed something. And we do not just mean NOX the Robot's performances – although they did fill the Twitter channels as much as the daily news. He amazed the public and proved that – true to his motto – "small components" can have a "MASSIVE IMPACT."

The congress and trade show filled every last corner of the Moscone Center – this reflects the increasing impact of our industry. As many as 1.345 exhibitors and approximately 22.000 visitors were registered. To continue growing, the exhibition area will be expanded; the renovations are expected to be completed in 2017.

The Photonics West trade show is the largest foreign trade fair for the LASER COMPONENTS Group.

The photonics industry comes together once a year in San Francisco for an intensive three-day exhibition in which innovations around the world are introduced. LASER COMPONENTS has contributed significantly to these innovations.

At the trade show, our customers came first. We are very happy to see the Nordic presence on the trade show grow year by year. From our conversations around the trade show floor, it seemed that the show was a success for those of you exhibiting. Our experience was the same and we are already looking forward to next year! We also had many important meetings with our suppliers. This is one of the best ways for us to quickly catch up on the news and to strengthen our network. ■

SPIE Laser Damage Competition 2015

LASER COMPONENTS Participated Successfully for the Sixth Time in a Row

The 3-day *SPIE Laser Damage Symposium* is held in Boulder, Colorado every year. This event is an opportunity for the exchange of information on the current R&D results of high-power and high-energy lasers; the symposium's main focus is on optical materials and coatings.

The symposium includes an international competition for the most powerful coating: The SPIE Committee defines the layer specifications for production.

In 2015, the following requirements were set:

- Reflection > 99,5%
- GDD < ± 100 fs²
- Wavelength λ = 773 nm ± 50 nm
- Angle of incidence 45°, p-polarization
- Pulse length 150 ps; repetion rate 500 Hz
- Laboratory environment (25°±2°C, 40% ± rel. humidity)

The damage threshold and the change in group delay dispersion (GDD) of the laser optics that were sent in were tested.

Sixteen companies/institutes from six countries participated in the challenge this year and sent a total of thirty-three samples into the competition. The test results remain anonymous to the general public; only the companies themselves learn how their products scored in the overall comparison. The SPIE Laser Damage Competition is thus an excellent opportunity to test product quality in a comparison of competing products. ■

New Products

1 **PRONTO Si** Mobile Power Meter in pocket format ■
2 **MVmicro DIG** Laser Modules with Microcontroller ■
3 **Sheaupack** High-Power Laser Modules with Fiber Connection ■
4 **COUNT® T** Single Photon Counter for Time-correlated Applications ■
5 **SAH Avalanche Photodiodes** Inexpensive APDs in an SMD Housing ■
6 **IR Conversion Screens** Make IR laser radiation visible ■

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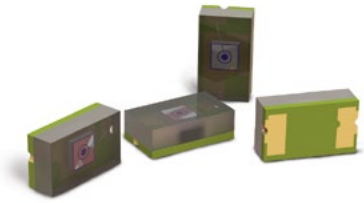

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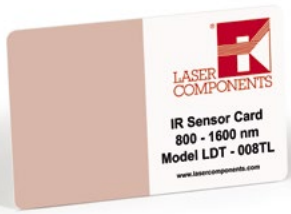

Mobile Power Meter with Silicon Sensor by Gentec-EO

Clear the Stage for the New PRONTO-Si!

WEB N04-071

"Take one, and action!" For the youngest member of the PRONTO family: The mobile laser power meter PRONTO-Si is here!

The term "mobile" can be used literally in this context: when this compact device is folded up, both the sensor and the color touchscreen display are optimally protected.

This smart design offers other advantages as well. In the area of the silicon sensor, this device is just 6 mm thick and allows for power measurement even in very tight spaces.

Thanks to the highly-sensitive silicon sensor with an effective aperture of 10 x 10 mm, it is possible to quickly and precisely measure power levels significantly less than 1 nW.

As if that were not enough: without the need for extra space, the range of measurement can be expanded into the three-digit mW range due to an integrated, "upstream" OD1 attenuator. Of course, this device automatically recognizes the activated attenuator and corrects the power measurement displayed without additional operator intervention.

Whether for use in the power measurement of cw laser modules to check the correct laser class designation or in the testing of structural and equipment laser protective measures, the PRONTO-Si is an indispensable aide for laser safety officers.

The charging of integrated Li ion batteries (for a runtime of up to 17 hours), the readout of internal measurement data memory (for 50,000 measurements), and future software updates can be carried out via the existing mini USB connection.

With its robust, easy-to-handle housing and its intuitive operation via self-explanatory symbols on an illuminated, touch-sensitive color display, this device fits seamlessly into the PRONTO series.
The PRONTO-Si by Gentec-EO is responsible for the "smooth" detection and measurement of low laser power in the wavelength range from 320 nm to 1,100 nm "in a blink." ■

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It's a Digital World – Our Laser Modules Are Too

MVmicro DIG Laser Modules for Image Processing Have a Microcontroller

WEB N04-174

The FLEXPOINT® laser modules that are equipped with a microcontroller carry the addition "DIG." The MVmicro DIG series was the first series of image processing lasers to be equipped with a microcontroller.

Communicate and Configure
The microcontroller opens up excellent possibilities for users who can communicate with the module via an RS232 interface and even configure laser parameters. This makes it possible to request the operating hours, temperature, or diode current. A certain output power or shutdown temperature can be programmed, for example.

Additional settings are possible via this interface; this includes digital or analog modulation and a variable power adjustment. In addition to the standard parameters, we also carry out custom programming.

Configure Your MVmicro DIG Laser Module
The MVmicro DIG laser is available in countless designs: The modules project either a single line or parallel multi-lines with a homogeneous power distribution. Further configurations are also available with a particularly thin line or an improved depth of focus. The lines can be easily focused by hand – tools are not required for this adjustment.

These modules are available in the following wavelengths:

- green
  520 nm, up to 40 mW of actual output power
- blue
  405 nm, up to 100 mW – 450 nm, up to 70 mW
- red
  640 nm, up to 30 mW – 660 nm, up to 100 mW
- near infrared
  785 nm or 830 nm, up to 100 mW

Modules with microcontrollers have housing dimensions that are very compact: 90 x 19 mm (length x Ø). The laser modules are operated with a voltage in the range of 5-30 VDC. For easy electrical connection, they are equipped with an M12 connector. ■

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High-Power Laser Modules with Fiber Connection

The SheauPac offers a revolutionary design in the smallest dimensions.

WEB N04-045

Both the small SheauPac housing and the efficient fiber coupling facilitate the high optical power of SheauPac laser modules: In multimode fibers, the level of power reaches to up to 8 W; in single-mode fibers, this level reaches to up to 300 mW. Both versions emit in the near IR range from 785 nm to 1064 nm and are available with a maximum operating temperature of up to 60°C upon request.

The hermetic housing is electrically isolated and measures only 22.10 x 12.70 x 4.70 mm.

There are two versions of the fiber pigtail available for selection: a 6/125 µm SM fiber or a 200/220 µm MM fiber. Upon request, each fiber can be equipped with an optical connector.

SheauPac lasers are used in medical and dental technology, material processing, printing technology, diode-pumped laser systems, fiber lasers, and illumination. ■

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Timing at Its Best: We'll Count for You

COUNT® T – Single Photon Counter for Time-correlated Applications

WEB N04-029

In time-correlated single photon counting (TCSPC), single photons are not only counted, but the time of detection is also determined based on a reference signal. Here, a laser pulse generally serves as a reference. This method is a statistical counting method.

TCSPC is used in particular in fluorescence lifetime measurements. This method is often compared to a stop watch: A laser pulse excites a sample (time start); just a few pico or nanoseconds later, a "fluorescence photon" is released (time stop). This time is recorded in a histogram. After many start-stop passes, a conclusive histogram is created that displays the intensity of the fluorescence depending on time.

The COUNT® T is equipped with an avalanche photodiode (active area of 150 µm) produced in house and features a high detection efficiency of >80% and a temporal resolution of up to 350ps.

In addition to fluorescence lifetime measurement (FLIM), the timing module is used in time-resolved fluorescence and single-molecule spectroscopy, as well as LIDAR applications. The technical data of the COUNT® T is given in the datasheet, which can be downloaded under the link provided. ■

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Inexpensive Avalanche Photodiodes in an SMD Housing

Silicon APDs for the wavelength range between 400 nm and 1100 nm with the smallest dimensions

WEB N04-035

Matching our high-end/low-cost pulsed laser diodes at 905 nm, we also offer Si avalanche photodiodes in a compact SMD housing. The dimensions are just 3.1 mm x 1.8 mm x 1 mm.

You receive an emitter and a detector with an excellent price/performance ratio from one source. These devices are made for such applications as range finding, speed measurement, laser radar guns, and security scanners, as well as for use in test and measurement systems in industry and medicine.

The SAH series has an epitaxial structure and is produced on 6" wafers. The new APD features a high sensitivity between 400 nm and 1000 nm and short rise times from 250 ps to 300 ps. Designs with a diameter of 230 µm and 500 µm are available for delivery. Another advantage includes a low operating voltage, which contributes to saving energy in portable systems (e.g., laser range finders). ■

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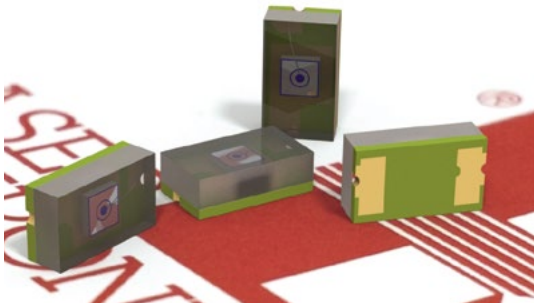

Conversion Screens for Infrared Laser Radiation

Four new detection cards for the wavelength range from 800 nm to 20 µm

WEB N04-051

We present four new conversion screens for the infrared wavelength range:

LDT-008TL. The LDT-008TL makes laser radiation visible in the wavelength range from 800 nm to 1600 nm. In a darkened room, minimum sensitivity is approximately 0.5 mW/cm²@1064 nm; the damage threshold for short-term exposure is almost 20 W/cm².

IR sensor card. Detection cards for the wavelength range from 1.5 µm to 20 µm are also new in our product portfolio. These detector cards are optimally suited for the radiation localization of Hol:YAG, Er:YAG, and CO_2 lasers.

Two versions are available each for these wavelength ranges:

- High-power version up to 120 W/cm² and 50 W/cm²
- Combined low-power/high-power version, low power up to 8 W/cm²

Please note that the LDT-007 and LDT-007B conversion screens currently cannot be delivered. We will inform our customers as soon as the cards are available again. ■

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IR WORKshop ir-workshop.info

Important Dates
Postdeadline:
June 30, 2016

3rd WORKshop on Infrared Technologies

7th and 8th of November 2016

LASER COMPONENTS hosts the 3rd International WORKshop on Infrared Technologies.
The event focusses on IR detectors for commercial applications, other IR components, corresponding periphery and their applications.

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WEB N04-IR

Combine your travel plans: Please note that the "electronica 2016" trade show will take place in Munich from November 08 – 11, 2016.

TRADE SHOWS

S.E.E.
Scandinavian Electronics Event
Stockholm, Sweden
April,
19 – 21, 2016
Booth C07:58

Elmia Subcontractor
Jönköping, Sweden
November,
08 – 11, 2016

LASER COMPONENTS