PHOTONICS NEWS

Company Newspaper of the LASER COMPONENTS (UK), Ltd.

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#62 ▪ 03|2019

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Dear Colleagues

As the UK decides how to handle the political ramifications of Brexit, the photonic industry saw strong growth in 2018, will it continue? In this issue, we look at some exciting advancements that can keep photonics buoyant for the foreseeable future.

Precision laser materials processing in the production of components in electric motor windings and battery manufacture help provide greener vehicles by reducing their carbon foot print.

Stereoscopic cameras installed in vehicles to mimic human observation provides some autonomous function. Adding other sensors, such as acoustic, radar and light detection and ranging (LiDAR), together help to provide all round 'vision'. All this data requires more computing power. The target? < € 200 system cost to the consumer for Level FIVE Advanced Driver-Assistance Systems (ADAS).

Using selected narrow band pass MIR optical filters, the wavelengths of absorbing gases can be chosen to build instruments for measuring CO, CO_2, NO_x, VOCs and other polluting gases. These sensors can help battle the struggle to reduce pollution.

Using the optical properties within optical fibres, it is possible to measure temperature and vibration up to 90km. We see how Deutsche Bahn embraces this technology.

We end our newsletter with a range of selected components relating to the articles featured; call us, we'll be delighted to help.

Yours,

Chris Varney
Managing Director, LASER COMPONENTS (UK), Ltd.

E-Mobility Requires Lasers and Digitisation

Electromobility is more than just a trend; it is on its way directly to the mass market. Companies such as the laser specialist TRUMPF see it as a great opportunity for both themselves and German industry because automobile manufacturers need innovative technologies for mass production. They require robust processes that can be quickly scaled from today's low production volumes to mass production. This calls for expertise in two areas: **laser technology and digitisation**. Laser technology can efficiently and affordably manufacture the key components of electromobility, such as electric drives, power electronics, and batteries. Digitisation is necessary to meet the production requirements of the automotive industry – maximum utilisation of capacity and maximum flexibility.

Electric mobility is on the rise worldwide. In 2017, more than one million electric cars were registered for the first time over the course of one year. This amounts to 57 percent more than in the previous year. China is the front runner with around 60 percent of all new registrations, followed by Europe and the USA. Delivery services and logistics service providers all over the world are also converting their fleets to emission-free electric vehicles, such as Deutsche Post with its StreetScooter. Impending driving bans in major cities suggest that the number of e-cars will continue to increase.

The growing demand for electric mobility is also becoming apparent at TRUMPF: every tenth euro of the Ditzingen-based high-tech company's sales in the automotive sector can be attributed to battery production – and the trend is rising. "We have the right manufacturing processes in place to economically manufacture the central components required for mobility in the future: only lasers can produce electric drives, high-performance electronics, and batteries in series so flexibly and at such a top level of performance," says Christian Schmitz, chief executive officer of laser technology at TRUMPF. ➔

e-mobility

New Hairpin Technology Reduces Cost of E-Motor

Automotive manufacturers are increasingly relying on so-called hairpin technology for electric motors. To generate a stable magnetic field, the stators (i.e., the immovable parts of an electric motor) are typically wound with copper wire. Each individual groove of the carrier unit is wrapped – the way a knitting needle is used. Due to the thick copper wires, this is too complex and time-consuming for strong electric motors designed to drive a car. In the hairpin process, a compressed-air pistol shoots preformed "hairpins" made of rectangular copper wire into grooves at the edge of the motor. The wires are then wound together and welded. The highest precision is required to maintain the electrical conductivity of the copper. Such clean and precise welds can only be achieved with lasers. "With our welding process for the hairpins, we ensure that electric motors can be manufactured quickly, safely, and cost effectively. The costly and time-consuming winding of coils with thick copper wires for strong electric motors is no longer necessary. This makes mass production considerably easier," says Schmitz.

"Green Technology" for High-Performance Electronics

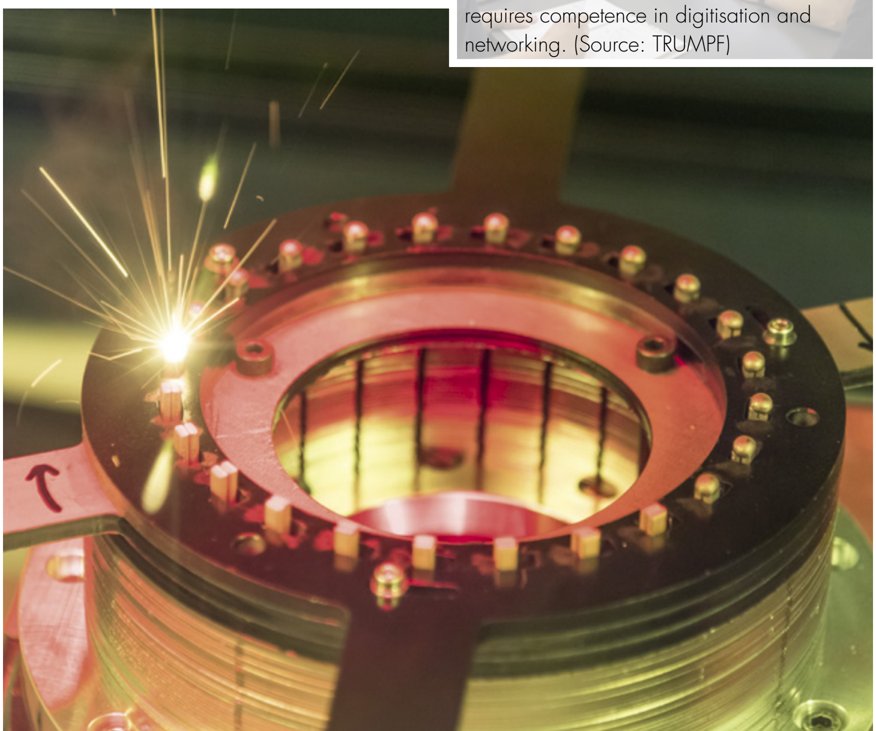
The designers relied on copper not only for the engine. While a 24-volt battery sufficiently powers the complete electronics of a combustion engine, voltages of around 800 volts are quickly generated in an electric car. To withstand this load, the designers use the excellent heat and power conduction properties of copper. However, the same capabilities of this metal also pose challenges: laser welding normally uses infrared radiation, but it is precisely in the wavelength range of around 1000nm that copper exhibits highly-reflective properties. Depending on the surface condition, uniform weld seams can therefore only be guaranteed to a certain extent – and is often not high enough for industrial purposes. Deep penetration welding can also produce spatter that damages the component and, in a worst-case scenario, leads to short circuits on the boards.

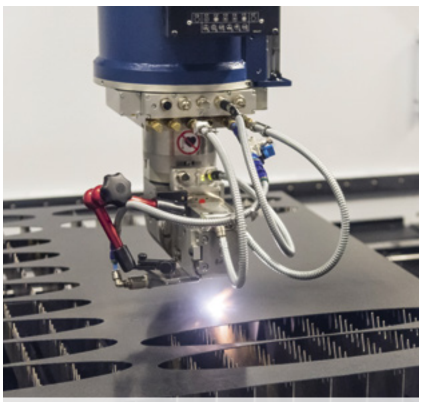

For mass production of electromobility it requires competence in digitisation and networking. (Source: TRUMPF)

TRUMPF has therefore developed a solution using a green laser. The green wavelength is absorbed much better by copper. Because the material reaches its melting temperature faster, the welding process starts more quickly and requires less laser power. While the infrared laser operates at 2.6 kilowatts of peak pulse power, the green laser uses 1.4 kilowatts for the same weld seam. This process is more energy efficient and produces significantly less spatter. This means that copper welds are always produced with consistent quality on every type of surface.

"In addition to factors such as the correct wavelength, laser optics also make a critical contribution to the precision of laser welding processes," explains Barbara Herdt, product engineer at LASER COMPONENTS. "They bundle the laser beam with all its energy onto a small spot. Due to the high energy of industrial lasers, a high laser damage threshold is a crucial factor. For special requirements, DOEs can be used to implement a wide variety of beam shapes."

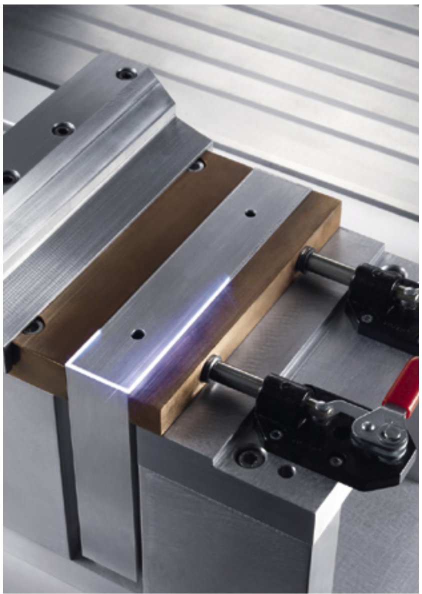
With these and other laser processes for electronic components, all 200 or so welds of an electric motor can be performed in just over a minute. The charger plug, current transformer, and rectifier are examples of the range of new power electronics being introduced into the car.


Welding hairpins using TRUMPF laser technology (Source: TRUMPF)


Laser technology processing of key electromobility components. (Source: TRUMPF)

Digitisation for Secure Battery Production

In addition to the production of motors and electronics, laser technology also plays a crucial role in the production of batteries. In this area alone, TRUMPF has already sold more than 500 lasers. The batteries consist of several layers of wafer-thin copper and aluminium foils, which are cut with the laser. The battery is then filled with liquid electrolyte and welded shut with a lid. These welds must be tightly sealed: if the battery breaks down during operation, there is a risk of fire and injury. From the battery cell via the battery module to the battery pack, the laser takes over all welding processes. The laser systems have sensor systems and are connected to a cloud solution via software. The sensors provide values for quality assurance and documentation but also control the welding process.



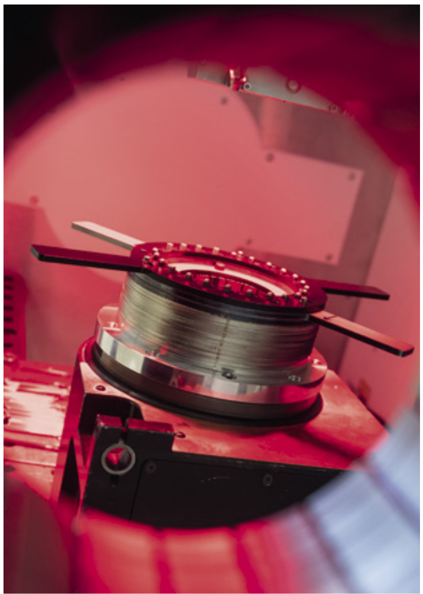
Laser welding a battery housing for a single cell in a battery block for electric cars (Source: TRUMPF)

Battery production requires not only know-how in laser technology but also in digitisation. This is because process monitoring is an important basis for stable production, especially in battery production for electric cars. "Battery manufacturers are faced with the problem that they can only test the functionality of the battery at the end of the production process. They need continuous monitoring of this process to ensure that the battery functions properly at the end of the process," says Schmitz. In addition, digitisation can generate data that is of interest to the end customer, including performance data, speed data, and sensor data that lists both the welding result and the seam width.

With this data, the manufacturer can document the quality of production, detect deviations from the standard, and intervene at an early stage. In addition, manufacturers are increasingly relying on maximum flexibility in their systems. They produce different types of engines – both internal combustion engines and electric cars – on one and the same production line. This flexibility can only be achieved if systems are digitised and intelligently networked.

Not Only Cars Drive Electric

The market potential of electric mobility is only just beginning to fully unfold because mobility via electric traction drive means more than just electric cars. Fully electric trucks with overhead lines are currently undergoing practical testing in Sweden and Germany. In Norway, the first strictly battery-powered passenger and car ferries are already in operation. In many parts of the world, municipalities are relying on electric street cleaning and gritting vehicles. The first fully electric tractors are already quietly ploughing furrows through fields. Bicycles supported by an electric motor have enjoyed growing popularity for years, and electric scooters are a market with millions sold per year, especially in East and Southeast Asia. All these e-vehicles require batteries, power electronics, and electric motors. ■



TRUMPF laser technology for efficient mass production of electric motors. (Source: TRUMPF)

On the Road to Self-Driving Cars

My Car and how it Sees the World

In the world of science fiction, self-driving cars are practically standard vehicles. In 'real life' we are catching up fast with authors' imaginations. Whenever this automotive future begins, vehicle-environment sensing will play a major role in achieving this next step because in order to independently steer through traffic, the vehicle must always be able to keep an eye on its surroundings.

A Bat in the Car?

Locating objects and navigating by ultrasound has been seen before in nature, by bats, that emit ultrasonic waves and can recognise prey and obstacles by means of a reflected echo. Artificially generated sound waves have a comparatively short range; therefore, they can only be used at close range.

The first models with this assistance system came onto the market in the early 1980s. Ultrasonic technology is now not only used at the rear of the car but with blind spot sensors or to measure the distance to the vehicle ahead at low speeds as well.

A Car with Eyes

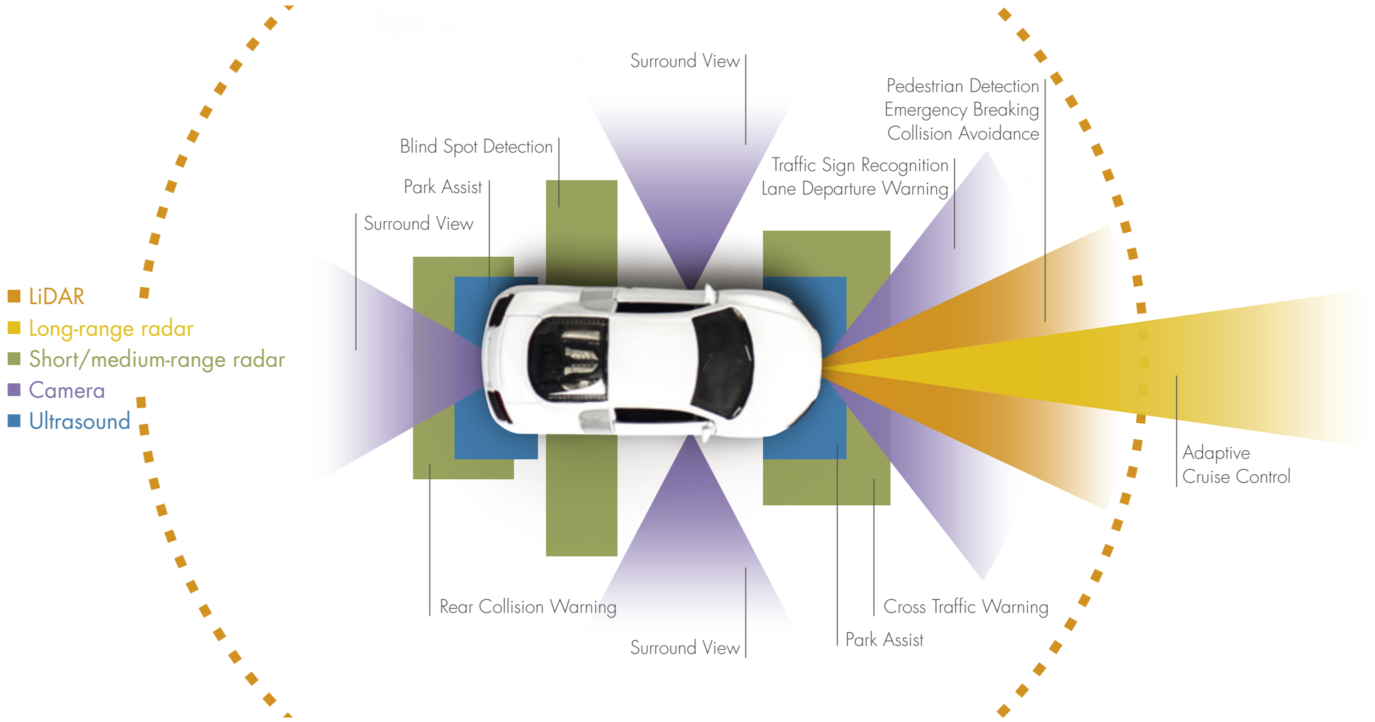
Camera systems probably come closest to imitating human perception. Software interprets the data to identify edges that might mean other vehicles or lane markings, 'as well as traffic signs or traffic lights. This information helps to prevent accidents and contributes to orientation because the camera also recognises details that are not recorded on the digital maps of common navigation systems.

There are two main problems with camera-based systems - the lack of three-dimensionality and the limited viewing angle. A single camera reduces the three-dimensional world to two dimensions. In an environment like street traffic, where there is a lot of movement, this can lead to a misinterpretation of data. Field of view and 3D perception can be overcome by using several cameras simultaneously, possibly with different focal lengths.

RaDAR or LiDAR?

RaDAR and LiDAR do not just happen to have similar "names." They are both used in detection and ranging. Like ultrasonic detection, they are based on the analysis of reflected waves - except that in one case the waves are RAdio waves and in the other case LIght waves.

Radar: frequency-modulated continuous wave radars, in which the frequency of the electromagnetic wave is constantly modulated in the form of a ramp, are commonly used in environment recognition. Using the doppler effect, the distance and speed of an object can be determined from the propagation time of the wave and the frequency difference of the reflected wave. Radar does not provide any information about the size or shape of an object.



LiDAR: LiDAR measurements use several thousand nanosecond laser pulses per second. The distance to the obstacle can be determined by the difference in transit time between the outgoing signal and the incoming reflection, the so-called time of flight (ToF).

Sensor arrays are used to monitor larger areas. The Fraunhofer Institute for Microelectronic Circuits and Systems (IMS) has recently even developed a chip that allows LiDAR measurements without moving elements (see box). Using the measurement points, a computer calculates a detailed three-dimensional image of the surroundings.

The LiDAR method, therefore, works considerably faster than the radar method and provides a greater amount of more precise data. Light attenuation by fog or humidity limits LiDAR to shorter ranges. For longer distances car manufacturers rely on long-range radars in the 77GHz frequency range.

Strength in Numbers

While a human being can intuitively draw on his wealth of experience and intuitively react to situations, a computer must constantly make new decisions. To do this, it needs as much data as possible. Each sensor system can contribute to this decision with its specific advantages and disadvantages. ■

Transmitter and Receiver from a Single Source

WEB UK62-0410

LiDAR systems need to be reliable, small, and cost effective at the same time. For manufacturers of laser-based measuring devices and optoelectronic components, this is a great challenge.

LASER COMPONENTS manufactures all components for powerful and future-oriented LiDAR solutions in its ISO-certified production facilities. Pulsed laser diodes with ultra-short pulses provide better resolution for distance measurement. In combination with highly-sensitive avalanche photodiodes (APDs), even the smallest signals can be detected.

In addition, there is a cooperation with the Fraunhofer Institute for Microelectronic Circuits and Systems (IMS) for 1-dimensional and 2-dimensional CMOS-SPAD arrays. The researchers from Duisburg can contribute new sensor technologies that promise particularly precise measurements. ■

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Dowload our LiDAR brochure!
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Roadside Monitoring

Tuning Down Pollution with Optoelectronic Technologies

It took less than a century for cars to become an indispensable part of our modern lifestyle. They keep us mobile and take us to faraway places. For many of us, even routine affairs such as the daily commute would be unthinkable without cars. However, the flip side of the coin has become as obvious as the advantages. Vehicular air pollution affects air quality in both metropolitan and small-town areas all around the world. Stratospheric ozone depletion and global warming are among the most pressing issues of our time.

Throughout Europe, politicians and scientists have been discussing a diverse range of measures to limit exhaustion of CO_2, greenhouse gases, and particulate matter. In some cities, only cars with even numbers may drive on even-numbered days, while elsewhere people must pay considerable fees to get admittance to city centres. In London, recent considerations about diesel bans have created an uproar but also increased the general concern about environmental affairs.

continue on page 012 ➔

Dr. T.K. Subramaniam has been working as a professor of physics at Sri Sairam Engineering College, Chennai, India for more than twelve years. As a renowned specialist in the field of laser spectroscopy, he has twenty-nine years of experience in research and industry. In 2004, he earned his PhD from the famous Banaras Hindu University (BHU) in Varanasi, India, where he also helped to establish a laser spectroscopy laboratory. His work includes twenty-three research publications in international journals of repute and a textbook on Engineering Physics recently published by the Oxford University Press (OUP). He also serves as a peer reviewer for the Optical Society of America (OSA) group of journals, i.e., the Journal of the Optical Society of America and Applied Optics. ■

More Realistic

In 2015 experts from the European Union, Japan, and India agreed on the Worldwide harmonised Light vehicles Test Procedure (WLTP) following the guidelines of the UNECE World Forum for Harmonisation of Vehicle Regulations. Any new model produced after September 2017 must comply with these regulations. In addition to the usual lab tests, cars must also undergo a so-called Real Driving Emissions (RDE) test following clearly-defined statistical guidelines. Some pollutants, such as nitrogen oxides (NO_x), cannot be determined under lab conditions but need to be tested in a driven car. Therefore, the RDE test will certainly deliver more accurate and extensive results. Some scientists, however, state that the bulky equipment commonly used for RDE testing leads to unreliable results because it changes the aerodynamics and weight of the car. Instead, they propose TDLAS systems that would easily fit into the boot of the car. Their detection units could be attached to the exhaust pipe without any convoluted constructions.

Controls for used cars have also been streamlined. After a maximum period of four years before the first check-up, every car must periodically undergo a vehicle inspection, which includes an emissions test. In most European countries, these checks are conducted every two years. Following these regulations, there is a certain need for every car on the road to meet governmental standards. Outside the EU, the picture is a little bit more confusing. In Canada and the US, for example, regular vehicle and emissions tests are part of provincial or state legislation. The Clean Air Act of 1990 merely requires the implementation of vehicle emissions inspection programmes in metropolitan areas where air quality does not meet federal standards. Therefore, there are virtually fifty different regulations within the US; sparsely populated states like Wyoming and Alaska do not feel the need for any inspection whatsoever.

Fixed Spots

In many cities around the world, pollution measurements are also conducted by fixed metering stations. The concentrations of pollutants such as SO_2, H_2S, CO, NO, NO_2 or ozone are monitored on a 24-hour basis, often using a different method for each substance. Sulphur compounds may be measured using UV fluorescence, NO_x values are determined by chemiluminescence, and CO is determined by IR absorption. This is a useful strategy to obtain an overview of the overall pollution. These stations do not differentiate between vehicular, industrial, and domestic pollution but provide an overview of the overall air quality at a specific point and time. Many of them are placed in heavy traffic areas; it can, therefore, be concluded that variations of certain pollutants are mainly caused by vehicle emissions. These stations are the main source for pollution values as commonly mentioned by the media. According to the Umweltbundesamt (German Federal Environmental Agency), the overall air pollution has decreased each year by 5% compared to 1995.[1]

1 https://www.umweltbundesamt.de/daten/luft/luftschadstoff-emissionen-in-deutschland

Tunable Diode Laser Absorption Spectroscopy (TDLAS)

As well as automotive, another safety critical application is the detection of carbon monoxide (CO) in mines. Tunable diode laser absorption spectroscopy (TDLAS) is a sensitive detection method that uses a tunable laser diode to determine the concentration of a substance by using specific wavelengths absorbed by CO, typically 4.66µm in the mid-IR or 1563.06nm in the near IR.

The CO absorption line of interest is scanned with a tunable distributed feedback (DFB) laser and an InGaAs photodiode is used as the detector. LASER COMPONENTS is a world leading manufacturer of extended InGaAs detectors. From our research and production facility in Arizona we supply customers all over the world with these industrial grade quantum detectors.

InGaAs PIN photodiodes have a smaller energy gap than Si photodiodes meaning that they are sensitive at longer wavelengths than Si devices.

The energy gap can also be adjusted by varying the composition ratio of In and Ga extending performance further into the infra-red. A typical standard product is the IG17 with a peak wavelength of 1.7 microns, making it ideal for this application. ■

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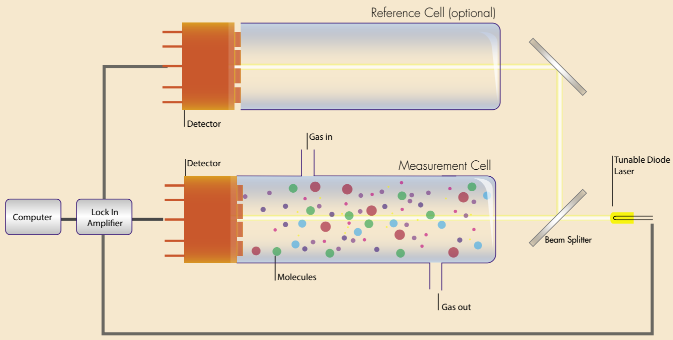

Roadside Measuring

It appears that European countries have finally found a way to keep track of their pollution and started taking measurements. However, the lion's share of worldwide CO_2 emissions is created outside Europe. The fast-growing industrial economies of China (29.1% of worldwide emissions) and India (6.98%) are among the top five. In 2014, the WHO declared New Delhi the dirtiest city in the world regarding particulate matter. The concentration was about ten times higher than that of the European metropolises of London and Paris. To cope with these problems, Indian scientists have come up with a reliable, cost-effective, and easy-to-use method for roadside measurement of vehicular emissions.

At the LASER COMPONENTS **IR WORKshop** in 2016, Dr. T.K. Subramaniam of the Department of Science & Humanities (Physics) at Sri Sairam Engineering College in Chennai, India proposed a laser-based method that would allow the in-situ roadside measurement of all pollutants in a single scan. He applied Tunable Diode Laser Absorption Spectroscopy (TDLAS), which builds on well-known spectroscopic principles and uses sensitive detection techniques, coupled with tunable diode lasers and optical fibres developed by the telecommunications industry.

Dr. Subramaniam proposes the use of TDLAS measuring systems (see box) for the roadside monitoring of exhaust gas emissions. To get results that reflect the average pollution rate of a car, measurements must be made at a time when the engine has been running for several minutes. The catalytic converters usually need three to five minutes to reach their operating temperature, during which time carbon monoxide and unburned hydrocarbons are released into the air. The emission of nitrogen oxides also increases with the motor load. Measurements, therefore, will have to be conducted on road sections on which cars are indeed driven. According to Dr. Subramaniam, highway intersection ramps and toll plazas would be the best spots for roadside exhaust controls. "At intersections, the motor has been running for a considerable amount of time; driving uphill puts additional strain on the combustion system. The ramps could, therefore, be used to check the emissions and environmental effects of each vehicle. At toll plazas, several instruments could be used simultaneously when the vehicles are at "idling condition" after running through long distances. In these places, it may be possible to add supplementary sensors to capture vehicle payload and other values that affect emissions", says Dr. Subramaniam.

"If the vehicle being tested is found to have emissions which violate the rules of the day as prescribed by a government of the day, a high-speed camera is activated within a microsecond or a picosecond to take a photograph of the license plate of the vehicle and the driver of the vehicle, as well as to note other details like the time and place of booking, etc. The driver will then be notified that his car needs maintenance. In grave cases, tough consequences could be implemented. If the car complies with regulations, the driver receives a badge showing proof of successful control." He is convinced that "TDLAS is a fool-proof method to detect and control vehicular emission. Remote sensing instruments can measure the emissions of thousands of vehicles per day."

Some US states follow a similar strategy by conducting mobile roadside emission tests – not unlike speed traps or alcohol tests. Experts state that compared to station-based tests, roadside controls can check thousands of in-use vehicles under real-life conditions. The data collected "on the road" could be used to improve government or manufacturer programmes. For example, they could be used to find out builds or models with particularly high pollution rates and thus help discover design flaws. ■

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Keeping an Ear to the Ground

Sensors are Monitoring Tracks and Trains

Around 15,000 locomotives, 8,000 passenger coaches, and 141,000 freight cars travel along the German railway system of 33,000km of track every day to transport goods and people from point A to point B[1], a mammoth task for DB Netz AG, the Deutsche Bahn's (DB) rail infrastructure subsidiary responsible for the rail network. Optical fibres and optical measuring methods can now aid in predictive monitoring and maintenance.

Hearing with Light

There is already over 14,000km of fibre optic cable covering the network for signalling, however, soon this could take on another task as optical waveguides for fibre optic sensing (FOS), including noise. Noise causes the optical fibre to vibrate, and any pulsed light within the fibre is deflected. Using the Rayleigh reflection, it can be assigned to a specific event in a database such as wheel wobble. In addition to locating damage and cable theft, this technology can also be used to determine the position and speed of a train. With latest technology, it is now possible to achieve ranges of 80km to 90km, double that previously achieved thus reducing the investment by half.

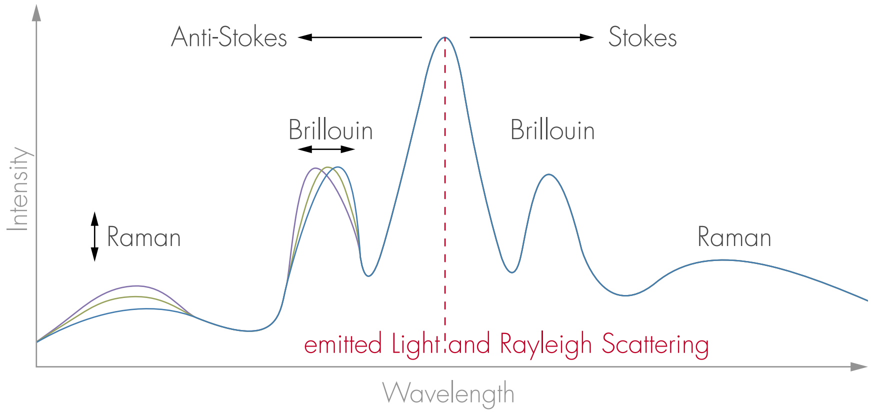
Proven Technology – Extensive Tests

Whilst not new, oil and gas companies have used this technology to monitor their pipelines, but at most only 4,700km long, a relatively simple task compared to the railways' network. In addition, it is primarily a single structure, while in some areas the railway tracks are very closely interlinked.

Preventive Maintenance

The vision is to build an intelligent system that, with only a slight expansion of the infrastructure, provides usable sensor data as a basis for decision making. In the case of comprehensive expansion, Deutsche Bahn would initially focus on monitoring the rail line and on train operation. Another area of application would be the preventive maintenance of rail cars. With FOS, DB will be able to counter problems sooner. In addition, the data obtained provides information about the condition of the infrastructure, material movements, and the location and speed of trains. ■

1 https://www.destatis.de/DE/ZahlenFakten/Wirtschaftsbereiche/TransportVerkehr/UnternehmenInfrastrukturFahrzeugbestand/Tabellen/Fahrzeugbestand.html



Rayleigh, Brillouin and Raman

The Optical Fibre as Linear Sensor

Some of the light entering an optical fibre is scattered backwards. Three different physical effects occur in this process: Rayleigh, Brillouin, and Raman scattering.

Backscattering: the measurement of backscattering uses Rayleigh scattering, of a given wavelength. Attenuation can be used to detect impurities or minimal changes in the fibre length.

Temperature: the effect of Raman scattering makes temperature changes 'visible'. Due to molecular fluctuations, the wavelength of the scattered light changes.

Thermal and mechanical disturbances: with Brillouin measurement, laser signals of different frequencies are sent from both sides into the glass fibre. When the waves collide, characteristic scattered light is generated, the wavelength of which changes measurably under mechanical or thermal stress. Temperature changes and strain on a fibre can thus be precisely localised to within a few metres.

Single Frequency Narrow Linewidth Lasers

Our partners Redfern Integrated Optics Inc (RIO) manufacture a reliable laser, to Telcordia standards, featuring ultra-low noise, very narrow linewidths, unparalleled wavelength stability, small size and low power dissipation, which is an ideal source for such fibre optic sensing including applications such as interferometry, Brillouin distributed temperature and strain sensing (DTSS) systems for oil and gas, security, smart infrastructure monitoring, LiDAR. Please see our advertisement on the inside cover of this newsletter for further information.

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New Products

Protection Class IP67

Laser Module ILM12IP is Dustproof and Waterproof

WEB UK62-0740

The FLEXPOINT® ILM12F laser module has always been robust; and now the ILM12IP version is virtually indestructible. This new housing complies with protection class IP67. This means that even the finest dust cannot penetrate it. It is also safe from exposure to water. Half an hour of submersion does not affect it. TÜV tests according to DIN-EN 60529:2014-09 have confirmed this.

All in all, this means that the ILM12IP can easily withstand the weather conditions at construction sites or outside facilities.

With its M12 external thread made of stainless steel, it can be screwed in and connected quickly and easily. This makes it the perfect tool for aligning machines, for adjustment work, and for positioning (e.g., when aligning a drill with a workpiece).

The module is available with a green (520nm) and a red (635nm) laser. The focus of the IP version can be set at a fixed distance or collimated. ■

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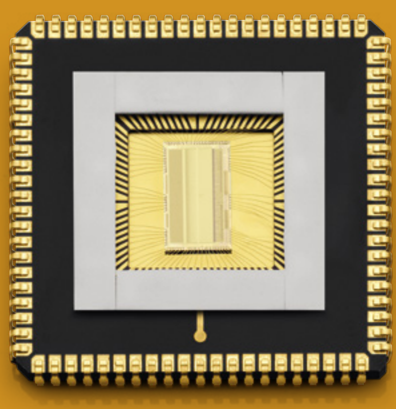
SPAD Arrays Expand Product Portfolio

Detector for Flash LiDAR Systems

WEB UK62-0350

Conventional LiDAR scanners use a failure-prone mechanism with rotating mirrors. Flash LiDAR technology, however, uses highly-sensitive 2D single-photon avalanche diode (SPAD) arrays. With a resolution of 2x192 pixels and noise <50cps, these components are around 10^6 (one million) times more sensitive than the photodiodes integrated in smartphones, for example.

Unlike classic LiDAR, the arrays do not detect just one point; each individual pixel provides information on the position. In addition, the sensor and evaluation electronics have been mounted on the same chip for the first time. This makes this new development particularly space saving. For example, car manufacturers could install it behind windshields or headlights. ■



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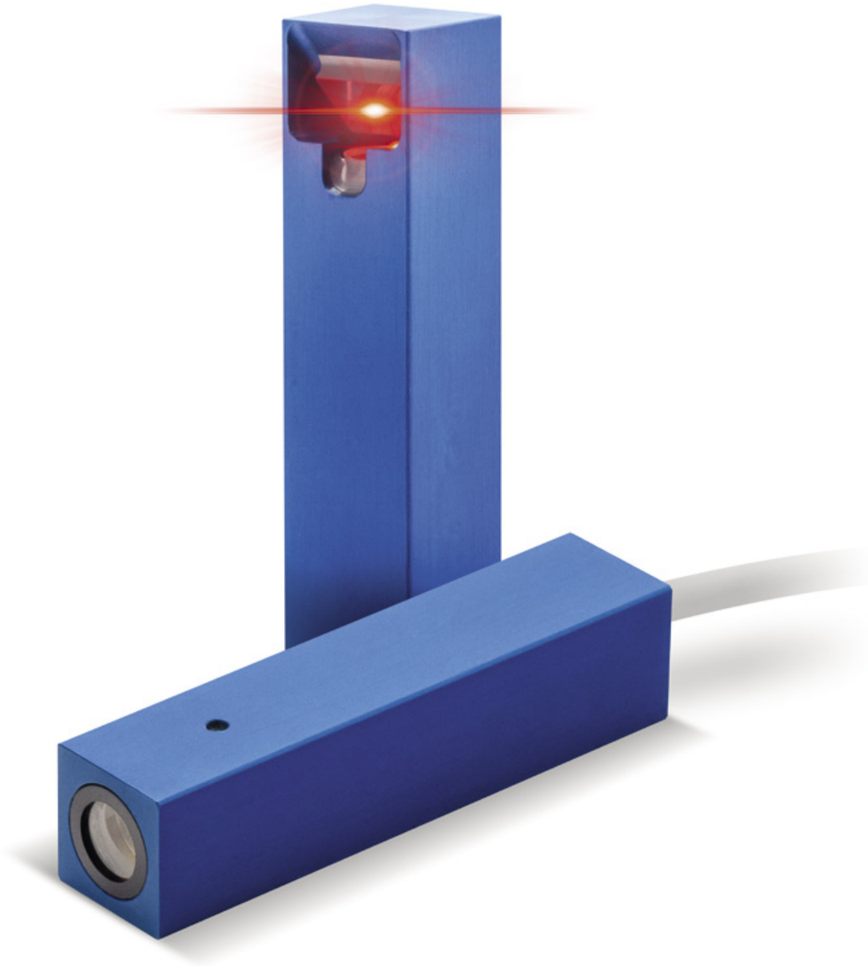
FLEXPOINT® MVsquare Line Laser Module

No Cares! Be Square!

WEB UK62-1740

One major challenge in the series production of 3D sensor systems for industrial image processing is the fine adjustment of the line laser. Focus and beam position must be set correctly for each individual module. The MVsquare offers a remedy for this: Its rectangular housing serves as a clear reference surface for the alignment of the line during installation. All parameters are set at the factory according to customer specifications and the module can be integrated without further adjustments. Since mechanical elements such as the focusing mechanism are not required, the customer can be sure that all parameters remain unchanged even after installation.

For applications in which every millimeter counts, the MVsquare is also available in a version in which the laser beam is deflected by 90° and exits the side of the housing. This saves considerable space in the z-axis, especially when installed in small sensor housings: Instead of the total module length of 65mm, it is only necessary to reserve 15mm. Nothing changes in the beam parameters. ■



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Laser Light – When Randomness Is Desired

Truly Random Patterns

WEB UK62-2740

The FLEXPOINT® MVstereo laser module was developed for 3D stereo image processing, in which three-dimensional structures are calculated from pixel information. For this purpose, the module projects a randomly arranged cloud of dots onto a surface. In addition to the "pseudo-random patterns" previously used, "truly random patterns" with 31,806 or 47,708 dots are now also available: Repetitions do not occur with these patterns – not even with partial patterns.

The range of pseudo-random patterns has also been extended: Versions with 40,100 and 29,594 dots are now also available. Due to the different number of dots and the different fan angles of the patterns, customers can choose the optimal optics for their application.

Such projectors are used in the recognition of gestures and in volume and depth measurements. ■

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New Narrow Bandpass Filters for LiDAR

Ideal for Range-Finding and FS Comms

WEB UK62-0850

In response to increasing demand for flat-top narrow bands for laser applications, we are pleased to add to our range of optical filters a new series of 4-cavity Fabry-Perot narrowband filters, ideal for demanding LiDAR, range-finding and free space optical communications applications. The filter coatings are fabricated from hard oxide materials so as to minimise wavelength shift due to temperature and angle of incidence variations, and ensure high durability. Spectral stability remains over a temperature range of -60°C to +80°C.

The range features multi-cavity designs with flat transmission peaks and a steep transition region to deep blocking of greater than OD4 from 1 – 2.5μm. Narrow bandwidths of 1nm – 5nm are available with customer defined centre wavelength values. Custom sizing is also available. ■

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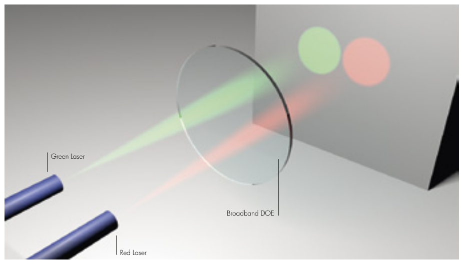
Broadband Diffuser

Diffractive Scattering Optics with 90% Efficiency

WEB UK62-0031

Broadband diffusers are used wherever light with several wavelengths must be scattered (e.g., in microscopy or in laser projectors in stadiums). Holo/OR has now developed a process with which high-performance scattering filters can be produced that cover a wavelength range from UV to NIR.

With an efficiency of greater than 90%, hardly any losses occur. Regardless of the orientation of the light source, the light is distributed uniformly and does not lead to a zero-order diffraction. The optics can be used like ordinary diffractive optical elements (DOEs) and are available for round, rectangular, and linear spot shapes. ■



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L220X1810

Dual Channel, Current Mode Sensor

WEB UK62-0330

The use of alcohol breathe analysers to immobilise a car if the driver is over the limit is becoming accepted. In Sweden, workers can be obligated to use the measuring devices as part of an employment contract.

Some areas in Australia and Canada have introduced requirements on people convicted of a drink driving offence to have the instruments installed in their cars before their licence is reinstated.

Methods of detection are based on Non Dispersive infra-red spectroscopy. Breathe from the subject is passed through a measurement cell where a broadband IR source is used to emit light through the cell to a detector. The detector uses IR optical filters to filter the light into an active channel at the absorption wavelength of the target gas and a reference channel. In simple terms, the light intensity at the detector decreases as the alcohol concentration in the chamber increases.

In order to measure gases at particularly small concentrations or very quickly a high sensitivity detector is required. The L220X1810 manufactured by LASER COMPONENTS is a dual channel, current mode sensor with a responsivity of 120,000V/W,. The device is housed in a standard TO-39, 4 pin package. They have long expected lifetimes making them ideal for this fit and forget application ■

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Solutions for Scientific, Defence and LiDAR Industries

Fibre Lasers and Amplifiers for your Applications

WEB UK62-0190

LASER COMPONENTS would like to announce that LUMIBIRD is now the new name of Keopsys-Quantel Group as of May 17, 2018.

LUMIBIRD develops and manufactures a large range of fibre amplifiers and fibre lasers from 0.35µm to 2µm wavelength as well as customised solutions. The company headquarters are in Lannion, France, where all manufacturing and development is based.

LUMIBIRD specialises in solutions for scientific, defence and LiDAR industries. Products cover a wide range of continuous and pulsed amplifiers and lasers too. These products achieve narrow linewidths with very low phase noise and RIN.

The amplifier range is available in both polarisation-maintaining and random polarisation versions delivering up to 42dBm of saturated output power with ranges specifically designed for amplification of short pulses. The amplifiers have a low noise

figure and are available with high gain (up to 50dB) and a variety of configurations to suit your application.

Both user-friendly benchtop platforms and modules are available and have exceptional build quality and reliability. ■

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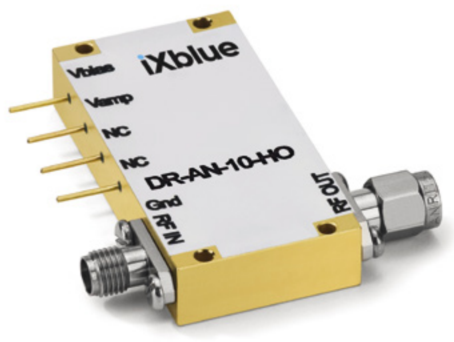
Drivers for Modulators and RF Amplifiers up to 40GHz

All Applications from Lab Experiments to Industrial Systems

WEB UK62-0960

Our intensity and phase modulators operate from low frequencies up to 40Gbps/40GHz and for a broad range of wavelength windows including 800nm, 1060nm, 1300nm, 1550nm and 2 microns.

Matched with the family of iXblue RF drivers, these modulators serve all applications, from laboratory experiments to demanding industrial systems. Our family of RF connectorised modules include drivers for modulators and RF amplifiers up to 40GHz and specific modules such as D flip-flop and delay lines. The modulator drivers are intended to feed modulators with an electrical signal exhibiting optimised peak-to-peak voltage, rise/fall time and jitter. Relevant applications for these modules include $LiNbO_3$ modulators, OFDM, radio over fibre, linear amplification, NRZ/RZ, DPSK, DQPSK optical communications, test and measurement, data synchronisation, RF signals synchronisation, data retiming, short optical pulse generation and much more! ■



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DBR Lasers

Photodigm Shifts to Extended Mode-Hop-Free Performance!

WEB UK62-0830

LASER COMPONENTS is glad to share with you the awarded US patents from our suppliers Photodigm, for their inventions related to extend the mode-hop-free spectral tuning range of their precision single frequency DBR lasers.

DBR lasers operate on the single longitudinal mode with the highest gain selected by the Bragg grating. A conventional DBR laser will normally exhibit a continuous, deterministic tuning range of up to 0.2nm before hopping to another mode. While this is sufficient for many applications, others require a wider continuous tuning range.

The recent patents from Photodigm cover design and manufacturing advances that extend the continuous tuning ranges from threshold to max rated power without a mode hop, the broadest deterministic tuning range of any monolithic laser diode.

Applications for the extended-mode-hop-free (EMHF) spectral range DBRs include spectroscopy, low noise pumping, LiDAR, and quantum information sources.

We are currently offering the EMHF configuration across our near-IR wavelength product range. ■

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