PHOTONICS NEWS

Company Newspaper of LASER COMPONENTS (UK) Ltd

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#67 ▪ 11|2021

UV Water Treatment

Photovoltaics

Fire Protection

New Products

PHOTONICS @ HOME

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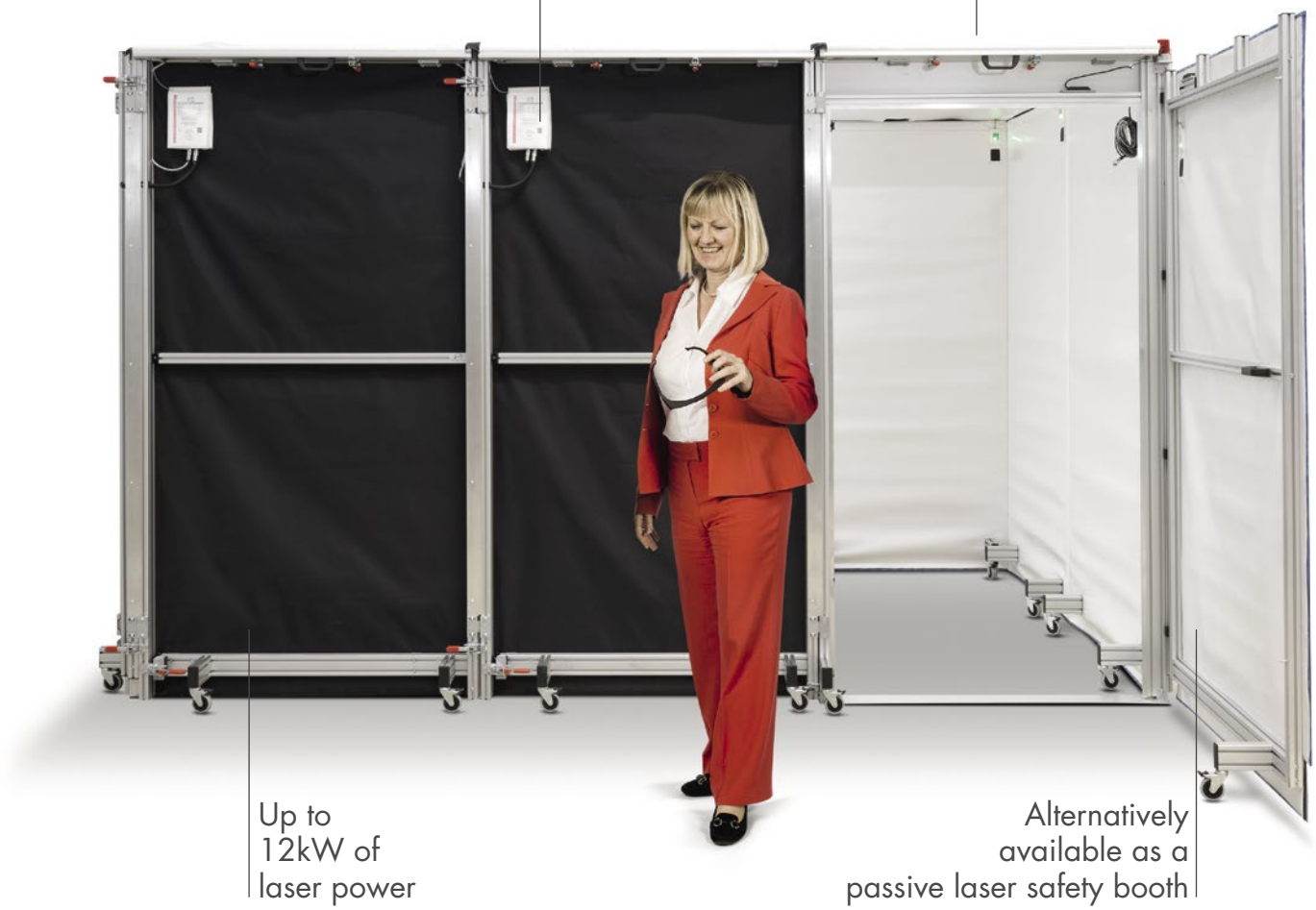

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Photonics @ Home

New Products

LASER COMPONENTS

Imprint

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Dear Reader,

This year has seen many challenges. The COVID-19 pandemic continues to impact all our lives and many businesses. Brexit advantages to the UK bring challenges too such as driver shortages, whilst the COP26 climate change conference seeks to achieve global net zero by mid-century. LASER COMPONENTS has however continued to grow in staff numbers, bookings and revenue. We are now a 250+ people organisation across seven locations worldwide, all achieved within 40 years, which we will be celebrating next year. These achievements have doubled since 10 years ago showing a growing demand for the photonic products we manufacture, and those we distribute from our valued partner suppliers. To keep pace with this growth a holding structure has been created with the formation of a holding parent company called Photona, to provide support and direction for the group.

But what does our group do? We manufacture and supply photonic components covering the UV to FIR spectrum, from sources of light, optics for manipulating light, to detectors for specific wavelengths or ranges of wavelengths. Many instruments include a form of all three components, for example, a laser diode light source at 785nm, focussing optics to deliver that light, and a detector to measure the Raman shifted light off a particular target material. Our components can be used to measure a particular property such as gas, dust, spectra, vibration, concentration of glucose, microgravity, communications, and so on, or functional uses such as delivering energy to satellites, mapping with LiDAR, curing inks with UV light, and more, the list is vast. Due to customer demand we also supply accessory products such as fibre optic tools, laser safety with curtains and goggles, and IR conversion screens. It gives us great pleasure to be involved in so many technologies providing solutions to new and challenging needs.

This Photonics News newsletter includes several exciting themes, such as using lasers to manufacture solar panels, delivery of optical fibre communications, water sterilisation with UV LEDs, and the use of infrared detectors to detect fires. We also present a range of new and improved components from UV photodiodes, efficient UV LEDs, single longitudinal modules (SLM) laser sources for Raman spectroscopy, and intelligent laser safety curtains.

Yours sincerely,

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

„The sun does not argue about light bulbs."

Pavel Kosorin (b.1964), Czech writer and aphorist

With the Power of the Sun

Electricity prices are rising, and environmental awareness is increasing. Many consumers are looking to gain more independence from the big energy suppliers – with renewable energy sources, of course. Setting up a wind turbine in the back garden or a private biomass power plant is an unrealistic endeavour. That leaves solar energy, and federal and state governments are promoting this initiative. At the same time, research and technology are working on more efficient and cost-effective ways to harness the power of the sun. Laser technology plays a decisive role in implementation. Will we soon be able to turn our houses into small solar power plants without having to cover them with unsightly mirror surfaces?

Will Transparent Solar Cells Soon Be Available?

Laser Innovation Brings Photovoltaic Production Back to Europe

Solar cells have been used to generate electricity since the 1950s – initially mainly in places where no other power sources were available (e.g., to power satellites in space). With its increase in energy yield, photovoltaics (PV) also became interesting for business and politics. It is now considered a cornerstone of a sustainable energy supply. In August 2021, the Green Party submitted a motion in parliament for a Solar Energy System Expansion Acceleration Act. According to this act, a photovoltaic system would be mandatory for every new building. In some federal states, corresponding provisions are already being implemented.

Solar silicon must be 99.99% pure.

Principally speaking, a solar cell is any technology that uses the photoelectric effect to generate electricity from light. Typically, silicon and other semiconductors are used. Silicon exists abundantly in the form of chemical compounds (e.g., as silicon dioxide in sand). However, for solar cell technology a purity of 99.99% is required because any contamination has a negative effect on the service life of the solar cells. The production of this so-called solar silicon is a complex, energy-intensive process with numerous intermediate steps.The production of PV modules is expensive.

Industry and research have, therefore, long been searching for alternatives to the classic solar cell. Two of them are presented in this article. In the first case, the aim is to increase the efficiency of Si cells and make production more efficient by using laser technology. In the second example, an alternative material is used. Here, too, lasers play a crucial role in production

Heterojunction – Higher Efficiency

Heterojunction technology (HJT) is when two different semiconductor materials come together. In the case of solar cells, this involves silicon in two different crystal structures: crystalline and amorphous silicon. HJT cells, therefore, absorb more solar energy than conventional cells. At the same time, the resistance in the module decreases, causing the efficiency to increase to up to 25%. Thus, HJT cells can still deliver electricity even, for example, when the sky is cloudy. In addition, their performance does not diminish even at high temperatures. They are said to have a low temperature coefficient.

The Swiss manufacturer Meyer Burger Technology Ltd. has further developed this technology, which originated in Japan, and is currently starting production in Germany. The fact that production was not outsourced, as is usually the case, is also due to a novel laser cleaving process developed by Innolas Solutions. Instead of

Solar modules will soon be flexible and transparent.

scratching the wafer and then breaking it mechanically, the machine does both in one step. The local, induced voltage of the laser beam allows the silicon wafer to be split along an almost freely selected cell edge. This is not only faster than the conventional method, but the particle-free method also results in fewer microcracks. This would otherwise impair the quality of the solar cells. Since the wafers are not broken mechanically, the cell breakage rate is also considerably lower.

Organic Materials – The Future of Photovoltaics

The future could belong to organic photovoltaics (OPV), which, in contrast to classic Si designs, rely on materials from organic chemistry – primarily synthetic carbon compounds. Most of these solutions are still in the developmental stage. However, there are some research projects running that are already testing their industrial production.

Organic solar cells offer many advantages. They eliminate the need for time- and energy-consuming silicon preparation. The only metallic components of the cells are electrodes, through which the generated current is channelled. In most cases, copper,

which is abundant in nature, is used for this purpose. The plastics used in the generation of electricity can also be used sparingly. Three grams of active material are enough for an area of ten square metres. The plastic layers are suitably thin; therefore, they can be "printed" onto almost any type of substrate using the roll-to-roll process.

Three grams of plastic are enough for ten square meters.

This also makes it possible to produce flexible modules and transparent versions. All these advantages open numerous new application possibilities. Organic solar cells could be integrated into buildings, facades, and glass surfaces, for example, and could capture solar energy directly where it is consumed.

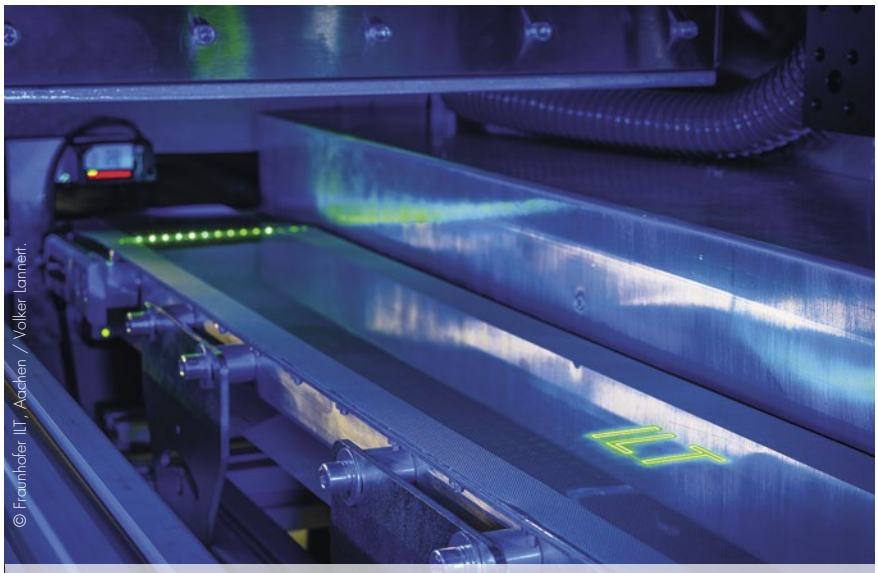
The biggest disadvantage of this technology is currently still its low efficiency. The highest value achieved in the laboratory was around 12%. On average, however, experts currently expect around 7%. This means that considerably larger areas would be needed to achieve the same effect as with conventional cells.

Precise Cuts in the Femtosecond Region

The roll-to-roll process allows large areas of solar cells to be produced quickly. However, this also poses a challenge because the larger the area, the higher the amperage of the generated current. To transport the current, cables with a large cross-section are needed, which would impair the flexibility of the cells. But there is a trick: if the total area is divided into numerous small cells, the energy yield remains almost the same and the current intensity drops to an acceptable level.

"The challenge is to remove the plastic layers, which are only nanometers thick, in such a way that the underlying layers are not damaged or short-circuited," says Ludwig Pongratz of the Fraunhofer Institute for Laser Technology (ILT) in Aachen. "Only a laser can do that." To scratch off the layers (in technical jargon, it is referred to as "scribing"), researchers use a femtosecond laser. For an extremely short period of one quadrillionth of a second, a beam of such high intensity is generated there that the material removed is converted directly into plasma without leaving any residue, while the substrate does not heat up to any notable temperature. The individual pulses are repeated at a repetition rate of 200kHz. This results in very precise cuts. At ILT, diffractive optical elements divide the beam into eleven partial beams and direct them onto the material, creating a module with twelve parallel rows of cells.

In addition to scribing, the research project also uses lasers to carry out other operational steps (e.g., a highly efficient drying process and the encapsulation of the photovoltaic cells). Thanks to the latest laser technology, nothing should stand in the way of industrial mass production and the use of organic solar cells. ■



A sensitive task: USP laser-scribing in the fs region is used to ablate nanometer-thin layers on a moving film.

How Pure Is Our Water?

When it comes to water hygiene, we tend to think of developed countries with safe water distribution systems and poor, third world countries where lots of people do not have access to drinking water. In the highly developed industrial countries of "the West", we take it for granted that we can drink tap water without considering any health issues. It is true that authorities have set up high standards for water quality. Municipalities and water suppliers go to great lengths to make sure these standards are met. So why are there still drinking water-related infections in highly developed countries such as Europe, Britain, or the U.S.? And are there ways to increase tap water quality?

➔

Drinking Water Put Under the Microscope

Fighting the Invisible Threats with UV Radiation

Contaminated water is one the main causes for many deadly epidemics such as cholera, dysentery, or typhoid fever. It was not until the mid and late 1800s scientists and physicians like John Snow, Robert Koch, or Louis Pasteur discovered the importance of water hygiene. Since then, an ever-increasing amount of effort has been put into hygiene and sanitation. Authorities such as the EU, the US Environmental Protection Agency (EPA),

> Water is the most thoroughly controlled natural resource.

and the World Health Organization (WHO) issue strict quality guidelines for drinking water. In most first world countries water-induced infections have been more or less irradicated, but still occasional outbursts occur – especially when the public water supply is interrupted by natural disasters such as floods, landslides, or hurricanes.

Did you know?[2]

- … that one third of the global population does not have access to safe drinking water.
- … that almost 6 billion people could be living in areas with temporary water shortage by 2050.
- … that the lives of more than 360,000 infants could be saved every year, if they had access to climate-resilient water supply and sanitation.
- … that climate-induced water stress can be reduced by up to 50%, if global warming is reduced to 1.5°C above pre-industrial levels.

One of the Best-Controlled Foods

Most of the drinking water that is supplied to our homes comes from natural sources such as lakes, rivers, and groundwater – sometimes even from protected natural reserves. Nonetheless, this water undergoes elaborate purification treatment at water treatment plants before being distributed to the consumers. The exact process differs from case to case, but in most cases, it includes the following steps[1]:

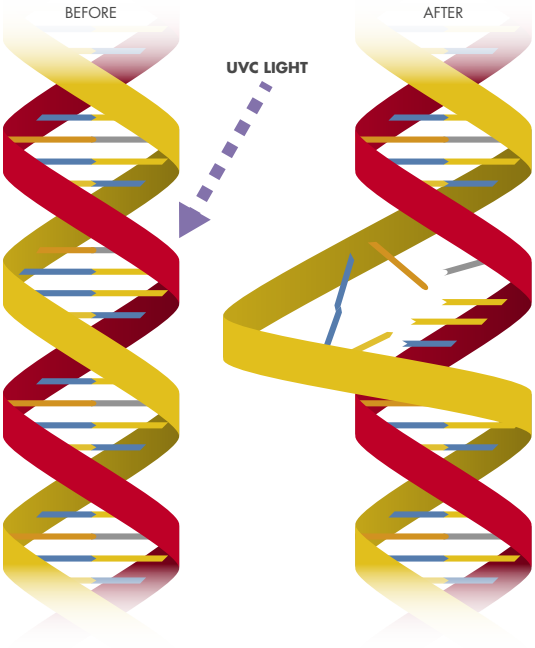
- **Coagulation and Flocculation:** Chemicals with a positive charge are added to neutralise the negative charge of particles that are dissolved in the water. Both react with each other to form larger particles called floc.
- **Sedimentation:** Due to its weight, the floc settles at the bottom of the water supply.
- **Filtration:** The clear water at the top is sent through various filters (e.g., sand, gravel, and charcoal) to remove finer particulate matter such as dust, organisms, and even dissolved chemicals.
- **Disinfection:** Remaining parasites, bacteria, and viruses are killed by disinfecting chemicals or UV radiation.

To avoid the risks that come with the use of toxic chemicals, many large-scale plants use UV light treatment as part of the purification process. The most effective wavelengths are in the UVC part of the ultraviolet spectrum, which ranges from 100 to 280nm. They are absorbed by DNA and RNA strands of viruses and microbes and break down the chemical bonds that form the double- or single-helix structure respectively. The germs are thereby destroyed or at least no longer able to replicate.

So far, sources for the highly effective UVC light were limited to low-pressure mercury lamps. Given their size and shape, these light sources are only fit for use in larger facilities. In addition to that, they are fragile, difficult to operate, and the disposal of toxic mercury is complex and expensive. With the emergence of high-power UVC LEDs, UV treatment is now also available for everyday use in homes.

Germ-Free Tap Water

Why is there any need for water treatment at home, if drinking water undergoes all these purification measures? The problem is that local authorities are only responsible for the water delivered to your home. Whatever happens on the customers' premises is their own responsibility, and there is a lot going on in the pipes and reservoirs of every private household and company facilities.



UVC radiation destroys the structure of DNA

1 https://www.cdc.gov/healthywater/drinking/public/water_treatment.html
2 https://www.un.org/en/observances/water-day

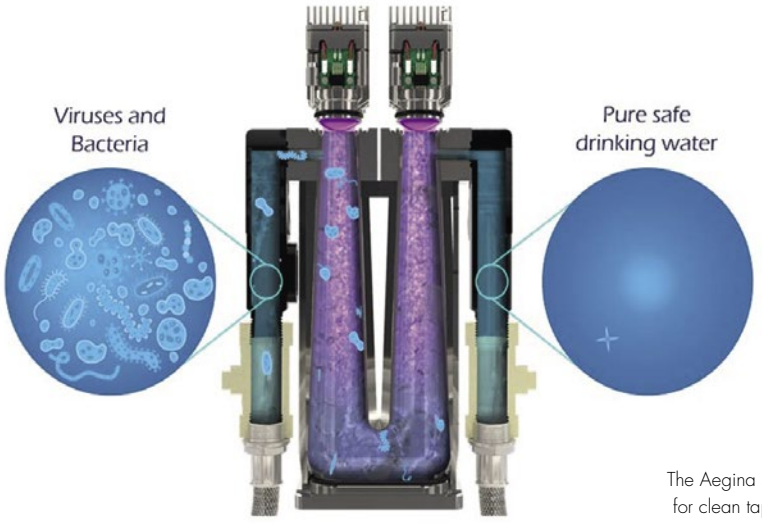
As long as the water is in motion, it is most likely to remain as clean as it was provided by the local utilities. As soon as it stands still for some time, micro-organisms begin to group together in slimy, glue-like substances, which allow them to stick to surfaces. These so-called biofilms consist of a wide variety of bacteria, fungi, and single-celled organisms. They are most likely to be found on the inner surfaces of water pipes, water storage tanks, or water heaters.

UV irradiation is a well proven way of water purification.

The biofilms themselves are not dangerous. Scientists even found out that they contain many organisms that contribute to keeping the water clean. On the other hand, biofilms also serve as a breeding ground for many dangerous pathogens and their slime "shield" protects them against chemical disinfectants such as chlorine. Biofilms in the water piping system may release germs into the otherwise clean water. Therefore, additional disinfection is recommended.

A highly effective method is to use UVC close to the consumer – just before the water leaves the tap. LEDs allow for space-saving, affordable and environmentally neutral solutions such as the Aegina Purifier line, developed by British manufacturer PRP Optoelectronics. The UVC sources used by the company comply to the NSF 55 Class A Standard which covers inactivation of microorganisms, including bacteria, viruses, Cryptosporidium oocysts, and Giardia cysts, from water. This kind of radiation is also harmful to other lifeforms including humans. The LEDs in the Aegina system are therefore placed within the closed piping, so that they pose no harm to humans or their pets. For increased safety, the UV light will automatically switch off if there is any alteration or damage to the system. The water is led through a U-turn in order to provide the time and amount of radiation necessary to destroy all germs. It also remains in motion during the whole process to avoid new contamination. With these measures the Aegina modules are able to deliver 99.99% clean water. With their low power consumption, the devices are designed for residential and mobile use. Depending on the model, they offer outputs of 3, 6, 12 and 18 litres of high-quality drinking water per minute. ■

LED technology brings disinfection technology to the home.



The Aegina solution for clean tap water

Germicidal UVC LED

The shorter the wavelength, the more UV radiation is absorbed by the Earth's atmosphere. This is why organisms on our planet have no natural defences against this type of light. The most efficient wavelengths for disinfection are between 250 nm and 280 nm. LEDs emitting in this spectrum are therefore called germicidal LEDs.

Our portfolio of germicidal LEDs includes wavelengths of 255nm, 265nm, 272nm and 275nm. Their optical power per chip ranges up to 100mW. ■

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Media: Data and Communications

Since the beginning of digitisation at the end of the 20th century, the development of networks has been dominated by one topic: bandwidth. Telephone, data, and moving images were once transmitted across different paths. The digital versions of terrestrial TV and cable TV are still in operation but are becoming less and less significant. Services are migrating toward an all-encompassing network. Streaming, VR gaming, and SmartHome applications are further fueling the hunger for bandwidth. Above all, they show that even private households are now retrieving data volumes that were reserved for companies not that long ago. Only one connection is currently capable of providing the necessary bandwidth over long distances and that demanded for shorter distances to the home: fibre optics. But why is that?

The Key Word: Bandwidth

Into the Future at the Speed of Light

Some of the first copper cables are probably still lying around or installed in old houses. For a long time, they did their job well and – principally speaking – still could. But traffic has increased dramatically since that time. Like the streets of city centres, traffic jams inevitably occur during rush hour. What do the future data traffic networks look like?

Why is an Optical Fibre Faster Than a Copper Cable?

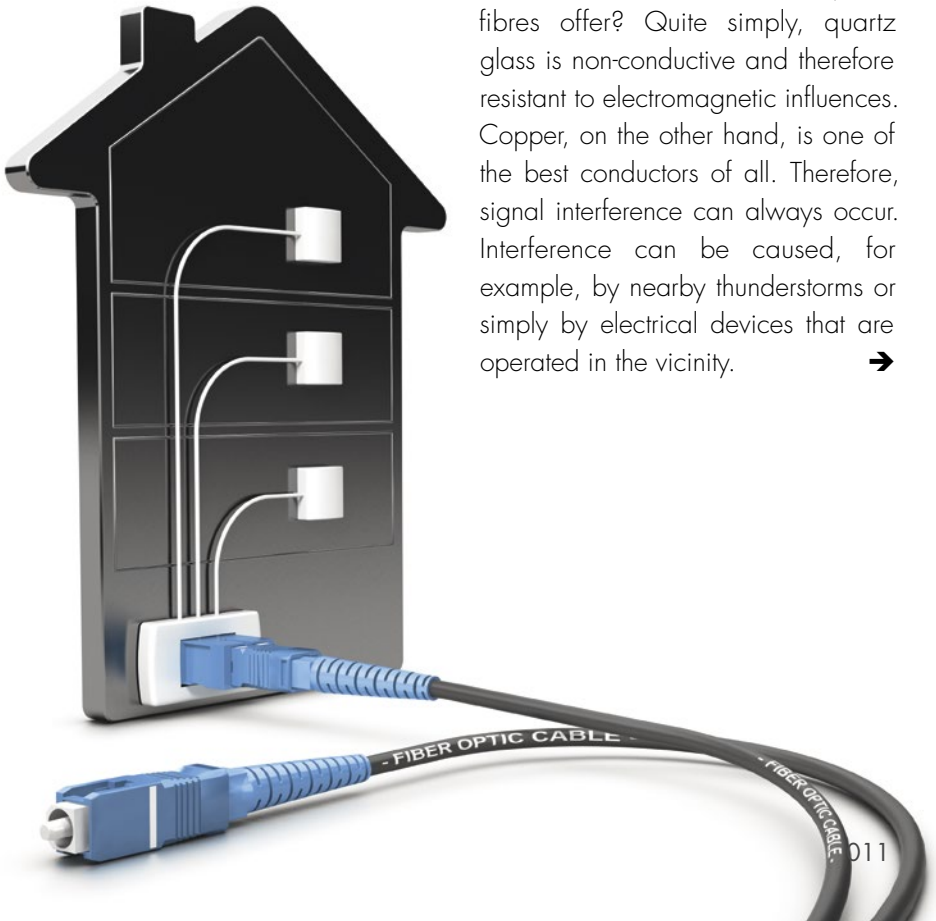
"Which is faster? Copper or fibre?" If you ask this question to passers-by on the street today, the answer will almost always be: "Optical fibre, of course." But is that really true? And if it is true, why is that? As usual in science and technology, the answer is more complex; however, it is also more exciting than expected.

Nothing is faster than light.

It is important to point out that in both cases we are talking about digital signal transmission. In the copper cable, the "zeros and ones" of the digital code are transmitted by electrical signals. Simply put, the current is switched on and off again and again. In an optical fibre (Fibre Optic Cable), this transmission functions with the help of light. At first glance, you might say: "Then it is pretty clear because, as we know, nothing is faster than light." That is of course correct, but it is also true that all electromagnetic waves travel at the speed of light, including electricity and radio waves. So why is light still the better transmission path in this case?

Higher Data Throughput

The number one issue is bandwidth. In industry jargon, this refers to data rate, which is the amount of information that is transmitted in one second. At a bandwidth of around 10 Gbit/s, cable television networks (CATV) are the most capacity copper networks. Depending on the type of fibre, optical signal transmission now allows several Tbit/s. In addition, technology today makes it possible to transmit many signals through the same fibre by assigning a specific wavelength (colour) to each signal. There are now networks available that support up to 160 colours simultaneously.



Longer Range

Another advantage of fibre optics is their low attenuation. With the high-quality fibres available today, distances of up to 120 km can be bridged with little signal loss. With copper cables, however, an electrical signal amplifier must be installed every 500 metres or so. This makes network expansion much more complicated and, on top of that, costs energy and money.

Up to 120km without signal amplification.

Interference Free

Most optical fibres are made of quartz glass, which is a brittle and sensitive. Copper, however, can be shaped almost at will. So, what material advantages should optical fibres offer? Quite simply, quartz glass is non-conductive and therefore resistant to electromagnetic influences. Copper, on the other hand, is one of the best conductors of all. Therefore, signal interference can always occur. Interference can be caused, for example, by nearby thunderstorms or simply by electrical devices that are operated in the vicinity. ➔

The phenomenon of "crosstalk," in which conversations conducted on neighbouring lines at the same time overlap each other, is also well known.

Temperature changes have little effect on optical fibres. This is illustrated by the fact that if copper is heated, its electrical resistance increases and inhibits signal transmission. A similar effect does not occur with optical fibres.

Future Proof

Although they are more expensive to manufacture, optical fibres are becoming more economical as bandwidth requirements increase, especially since the fibres and network components are comparatively low maintenance. Best of all, the technology is scalable for the foreseeable future. The networks can be adapted to the constantly growing bandwidth requirements with little effort because the fibres and splitters can continue to be used unchanged. Only the end devices may need to be replaced.

And How Do the Fibres Get into the Home?

When will the average citizen be able to enjoy this fabulous technology? The answer is a bit more complex than the question:

Just picture a fibre optic network like you would a tree, in which water is distributed from the trunk, through smaller and smaller branches and twigs, to the individual leaves. In telecommunications, the trunk is referred to as the backbone or transport network. The leaves would be the so-called subscriber lines (i.e., the connection sockets) to which the user connects their terminal equipment (router, telephone, computer, television, ...). The transport network now consists almost exclusively of optical fibres, the closer we get to the leaves of the tree, the more frequently we still encounter copper cables. The so-called "last mile" (i.e., the distance from the familiar grey distribution box at the roadside to the user's home) is currently considered particularly critical.

> The federal government is investing billions.

In Germany the Association of Telecommunications and Value-Added Service Providers (VATM) states that at the end of 2020, around 1.87 million of 41.5 million households nationwide were supplied with optical fibres. This corresponds to just 4.5% of households. However, the industry association also assumes that the network will be expanded to around 25 million households by 2026. The federal government's broadband funding programme is providing around EUR 12 billion for the expansion, which is to be used primarily in areas where data rates are still below 100Mbit/s. This means a lot of work for the companies involved. The effort is well worth it because fast internet is the key to the digital future. ■

Optical Time Domain Reflectometer

Tempo's Optical Time Domain Reflectometer (OTDR) is an ideal tool for the measurement and characterisation of fibres prior and during deployment in a network. It is a must for installation and maintenance with its additional all in one functionality, it includes an Optical Power Meter (OPM) and Visual Fault Locator (VFL). The 930XC OTDR covers a diverse range of networks being deployed and already installed. Multimode and singlemode versions are available with 2 or 3 wavelengths respectively, additional wavelength options for 1490nm (GPON testing) and 1625nm (live fibre/macrobends testing). ■

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„It Is Useful to First See the Spark Before the Fire."

Japanese Proverb

Residential fires are among the most feared dangers of everyday life. Luckily, we can take precautions. In many countries, homeowners are required to cover financial risks with fire insurance and experts recommend having a fire extinguisher ready at hand. Most of these measures only deal with the most obvious feature of a fire: the flames. For a long time, the most dangerous aspect went unnoticed. Most of the fire-related deaths are caused by smoke. It was not until about a decade ago that authorities in many countries took this into account and made smoke detectors mandatory for all homes.

There Is no Smoke Without Fire

Optical Technologies in Fire Protection

Silent Killers

In 2019, approximately 90% of the fire related deaths and injuries in the US occurred in homes or apartments.

Smoke is more deadly than fire.

There are no official statistics for the EU but estimates of the European Fire Safety Alliance show similar rates at approximately 80%. In those cases, most people do not die from the flames, but from the smoke.

Depending on the burning materials and on the amount of heat generated by the fire, smoke consists of different gases. All of them are dangerous, but in different ways.

The most frequent and deadly components are the so-called "toxic" gases, which include carbon monoxide (CO), carbon dioxide (CO_2), and even hydrogen cyanide (HCN). They affect respiration in different ways: carbon dioxide is commonly known as the "waste product" of respiration that is released when we exhale. The problem is that the whole metabolism gets out of balance when the CO_2 concentration increases. If the air you inhale contains more than 10% CO_2, you will be dead in less than a minute.

Carbon monoxide is just as lethal, but in a different way. Its molecules attach themselves to the haemoglobin in the human blood, which is there to transport oxygen to the cells. This causes the body to suffocate as the cells do not get enough oxygen to function. The most dangerous fact about CO is that it does not have a smell or taste. Cyanide causes breathing difficulties very rapidly when it is inhaled or absorbed through the skin. Like CO it also affects the metabolism, but on a different level, prohibiting energy production within the cells. In fact, most victims suffocate in their sleep before they even notice the fire.

This is where smoke detectors kick in. As soon as they detect a potentially dangerous amount of smoke, they set off an alarm and make sure that the inhabitants wake up. ➔

IR-Detection Saves Lives

In most cases, smoke detectors use optical technologies. The concept is as simple as it is effective. It consists of a light source, some small mirrors, and a photodiode. The mirrors guide a light beam through a dark box and make sure that it never hits the detector.

Diffused light triggers the alarm.

As soon as smoke enters the box, the light is scattered and reaches the photodiode, which then triggers the alarm. However, there must be some type of margin. You do not want the alarm to go off with every candle you light. On the other hand, it should be triggered if the candle falls to the floor and sets the carpet on fire.

Home applications use a simple IR emitter and an off-the-shelf photodiode, while the more expensive industrial applications employ the more sensitive combination of a brighter (laser) light source and a more "professional" photodiode.

Whether in the home or in a business, all smoke detectors require smoke to physically reach the detector. Valuable time passes on the way there, and the direction of movement of the smoke depends on numerous external factors. A small gust of wind can have a profound effect on the direction of the smoke. Optical flame detectors, on the other hand, do not require contact. They work quickly and from a distance. Their IR sensors react to the flickering of flames or sparks. An algorithm analyses whether they correspond to patterns that occur during fires. For example, they are also able to detect sparks through windowpanes, billows of smoke, and dense fog.

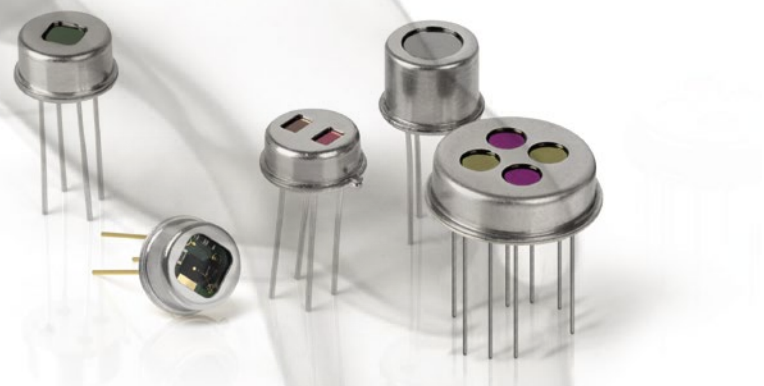
Spark detection is particularly important where explosive dust floats in the air (e.g., in wood processing, grain processing, and cement plants). The key here is to react quickly and, if possible, extinguish the sparks while they are still in flight to prevent any further damage. Quantum detectors (PbS, x-InGaAs) dominate these sensors.

Another industrial application is flame detection. In this environment, many fires originate from the combustion of hydrocarbon compounds. Such fires often spread further than the visible flames would suggest. Pyroelectric detectors can be used to determine their true extent. This sensing technology

IR sensors detect flying sparks and invisible fires.

detects the products of combustion, such as CO_2, by measuring light emissions at specific wavelengths. At hot temperatures, gases emit the same wavelength of light that they otherwise absorb. This makes it possible to clearly determine the type of gas in the detector's field of view. Pyroelectric detectors are always used in combination with infrared filters that block out the "ambient noise" generated by solar radiation or by atmospheric CO_2. For multispectral detection of IR radiation from flames, a multiple combination of three or more detector/filter pairs is usually used.

All these systems operate quickly and with extreme precision because in industry you cannot afford false alarms. If sprinkler systems or other extinguishing systems are triggered incorrectly even once, the consequences can be just as devastating as a fire.



Extensive Range of Detectors

Smoke and fire detectors come in many configurations and price ranges. The detector technologies used in them are correspondingly diverse. Each technology has its specific advantages. With a wide range of IR components, LASER COMPONENTS ensures that you always use the optimal technology for your fire protection solution. The best detector does not necessarily always have to be the most expensive.

LASER COMPONENTS Detector Group in Chandler, Arizona manufactures pyroelectric, PbS, and (x) InGaAs detectors according to customer specifications. ■

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Intelligent Solutions Go One Step Further

Standard solutions have so far included combining the smoke detector with either a heat sensor or a carbon monoxide sensor. DEF, a French solutions and services provider of fire safety systems, recently developed an intelligent, connected device that combines all three of these technologies for the first time. Most standardised multi-sensor detectors combine smoke detectors with either heat or carbon monoxide. The premium version of this solution is self-learning. It uses built-in algorithms to process the signals from the various sensor technologies.

For this purpose, they record and analyse the alarm context and the last 100 events. In this way, they can determine the type of fire and thus adapt their sensitivity to allow for earlier detection but also reduce the number of false alarms.

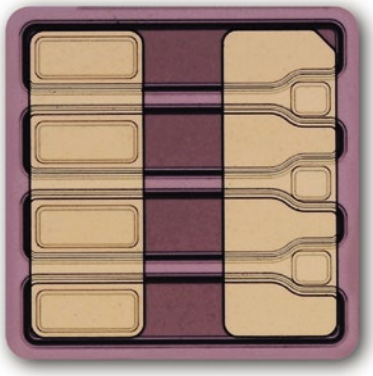
While the first of these multi-functionality devices were designed as premium products for factories and shopping centres, they are already on their way to the common living room. As part of a smart home, they could be controlled with any type of mobile device and allow you to react to dangerous situations, when you are miles away … assuming you have access to a high-performance data network. ■

Wide Range of UV Solutions

Broad Variety of UVB and UVC LEDs

WEB UK67-0810

LASER COMPONENTS now offers UV LEDs from the South Korean manufacturer Photon Wave. The range of products includes UVB wavelengths of 295nm and 308nm, as well as UVC LEDs with 255nm, 265nm, and 275nm. All components are available as SMD chips or bare dies in various sizes to be quickly and easily integrated into a wide range of applications. The power range extends from a few milliwatts to 100mW per chip. This is currently the highest power possible.



With operating voltages between 5.7V and 6.3V, all LEDs are also suitable for mobile use.

While UVC wavelengths are replacing mercury vapour lamps in the disinfection of air, water, and surfaces, the UVB spectrum is used in such diverse fields of application as horticulture and dermatology. ■

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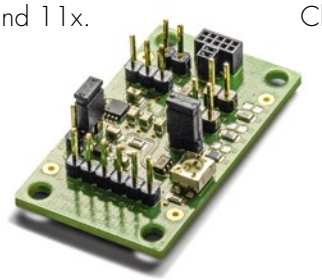
User-friendly Control Board

Versatile Transimpedance Amplifier for SiC UV Photodiodes

WEB UK67-0380

The photocurrents generated by photodiodes are often in the range of a few nanoamperes. To be able to evaluate them better and use them for desired applications, they must be amplified and converted into voltage. For SiC UV photodiodes in our range of products, we recommend the JTIA1-1G transimpedance amplifier from ifw optronics. The user-friendly amplifier board can be connected directly to the TO5 or TO18 housings of the photodiodes.

Customers can choose from three preconfigured values via jumpers for their measurements: 10MOhm, 100MOhm, and 1,000MOhm. The photocurrent is amplified at a ratio between 1V/nA and 0.1V/µA. A trim potentiometer can be used to further amplify the output voltage by a factor between 1x and 11x.



This amplifier component supports numerous application possibilities in pre-series production and in the final product. This allows you to quickly use your SiC UV photodiodes without investing time and effort in developing your own PCB. ■

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Ready for Use without a Power Supply

Operating Laser Modules with a 5V USB Connection

WEB UK67-0740

In the future, you will also be able to operate FLEXPOINT® laser modules with M12 connectors without a fixed power connection. Using the M12 USB cable, you can connect your laser module to any USB power supply (i.e., a commercially available power bank, a USB power supply, or the USB port of a computer).

With a portable USB power source, you no longer have to worry about national differences in mains voltage, frequency, and plug type. Standard USB ports follow the 5V norm while the FLEXPOINT® laser modules require at least a 10V operating voltage. In the cable, the voltage of the USB power source is transformed up to 12V to allow you to operate all modules without a problem. ■

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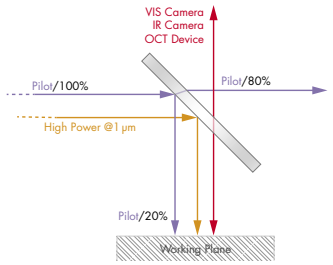
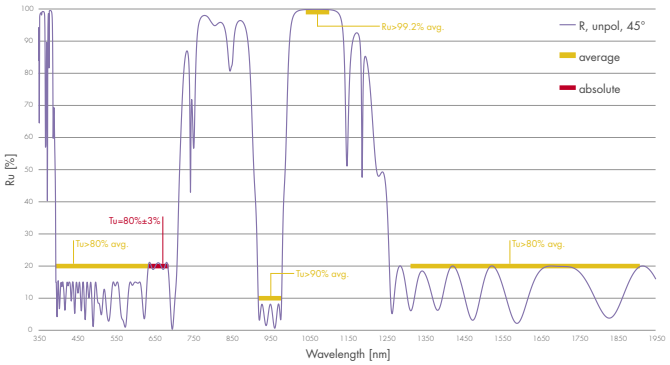
New Monitoring Possibilities in Laser Material Processing

Polychromatic Beam Splitters for Three or More Wavelengths



WEB UK67-0010

Complex sensor systems are at the heart of laser material processing in Industry 4.0. They control and monitor digitised processes. This also means new challenges for the optical components. It is not uncommon for a single optical system to have to direct the wavelengths for three or more detectors. The solution is polychromatic beam splitters from LASER COMPONENTS. We have developed mirrors that transmit the signal for cameras in the infrared range (1300–1900nm) and in the visible range (400–700nm). Additional wavelengths can also be accommodated, e.g. for a pilot laser (650nm) or an optical coherence tomography (OCT) system for depth measurement (950nm).



At the same time, the coatings are robust enough to permanently withstand a high-power laser for material processing (1030–1080nm). Which parameters do you need to monitor? Send us your requirements and we will develop the right coating design for your needs – no matter how complex they may be. ■

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Pyroelectric Detectors for the Detection of Hydrogen Flames

More Safety for the Driving Force of the Future

WEB UK67-0330

Flame detection is a crucial safety feature for the hydrogen-powered cars of the future. This applies to burner control in the engine, as well as to open flames at hydrogen filling stations.

H_2 flames are invisible to the eye but can be detected by IR detectors (e.g., the L2200D1810-JH from LASER COMPONENTS). With a newly developed IR filter combination, this pyroelectric detector measures the IR emissions of water molecules at 2.95µm as produced during the combustion of hydrogen. This component is supplied as a dual-channel detector in a rugged TO-39 housing. ■

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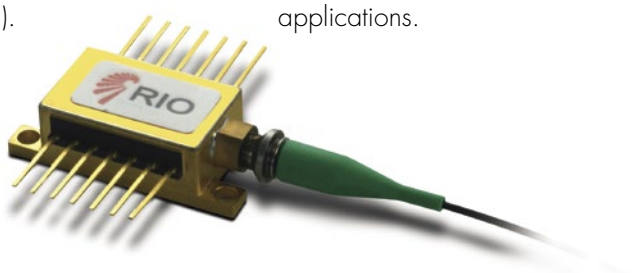
Superior Narrow Linewidth Lasers

Ultra-low Noise, Unparalleled Wavelength Stability

WEB UK67-0830

LASER COMPONENTS offers a highly reliable laser source supplied either as a butterfly package (PLANEX) which consists of a gain chip and a planar lightwave circuit (PLC) that includes a Bragg grating or as an OEM version (ORION).

Our lasers provide distinct advantages with performance of high stability, reliability, and a small footprint, meeting highly demanding environmental applications such as O&G, infrastructure monitoring, LiDAR, military, security, and other optical sensing applications.



We supply these lasers with an extreme narrow linewidth down to < 1kHz with ultra-low noise, unparalleled wavelength stability and low power dissipation. Wavelengths available are 1550nm, C-band (ITU channels or custom) and 1064nm with an output power of 10mW or 20mW with SMF or PMF pigtail options. ■

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JUTEC Laser Protection Textiles

Active Protective Textile Switches Off the Laser

WEB UK67-1540

Active laser protection textiles from JUTEC ensure safety in accordance with DIN EN 60825-4 in high-power laser applications. While passive laser protection materials serve as a barrier between the laser and the outside world at low and medium laser powers, the active textiles ensure that the laser is switched off in an emergency. This eliminates any further danger.

The special feature of the certified JUTEC protective fabric is an active sensor textile that is connected to the laser's circuitry via switch-off electronics. If the fabric is damaged, its physical properties change in such a way that the laser is switched off via the electronics. Beam emission is stopped immediately.

The active material is embedded between two layers of classic laser protection fabric. This guarantees that the protective circuit is not already triggered at low radiation intensity. In addition, the time that elapses between the triggering of the stop signal and the absence of laser radiation is bridged. All in all, the protective textile is only about 10mm thick. It can be cut to all shapes and sizes and is therefore flexible in use. ■

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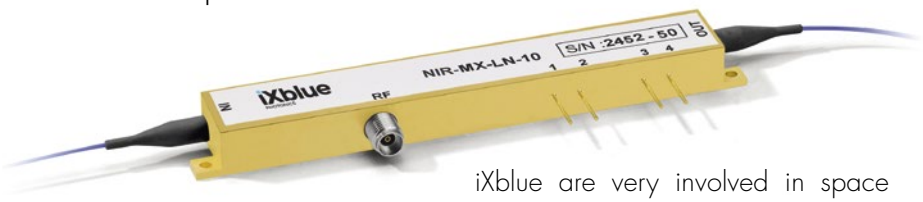
Modulators for Laser Communication in Space

$LiNbO_3$ Modulators

WEB UK67-0960

LASER COMPONENTS supplies iXblue Photonics' electro-optic lithium niobate ($LiNbO_3$) modulators. iXblue has a continuous presence in space across its Astrix product range of 3-axis fibre-optic gyroscopes (FOGs), opening the way to supply space grade components, such as passive and doped fibres, as well as phase and amplitude modulators.

The $LiNbO_3$ modulators have a long-standing proven record of use in many applications (e.g. long-haul and radio over fibre communications) as well as distributed temperature sensors (DTS) where the modulators operate in harsh environmental conditions, and have been comprehensively and successfully qualified (e.g. Telcordia).



A unique combination of performance is offered making them prime candidates, not only to satisfy the optical system specifications, but also to meet the tough requirements of space operation. Today, many embarked space photonic systems use light modulators as a key component to achieve intensity or phase modulation of various light sources at different operating wavelengths.

iXblue are very involved in space applications for telecommunication and inter-satellite telecommunication.

More than 200 modulators have been supplied for different flying users worldwide, either for big players or space agencies, and for LEO or GEO satellites. We supply 850nm, 1064nm and 1550nm amplitude modulators and phase modulators as Breadboard, Engineering, Qualification and Flight models. ■

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Passive Components

For all FO Network Configurations

WEB UK67-0115

For your network design needs as well as deployment LASER COMPONENTS has a vast range of passive components to help build traditional and future systems.

For WDM transmission networks we have modules for DWDM, OADM and CWDM/CCWDM. We have a vast range of couplers, isolators and circulators along with a diverse range of switch technologies to suit specific application needs. There are EDFA amplifier components in addition to MEMS VOAs for complete network build. WDM components are available in R/B, C/L and OSC.

For data transmission we have coupler modules with ratios 20/80,30/70,40/60,50/50%, circulator and isolators 850nm, 1310nm. CWDM/CCWDM optical modules are available, 1310/1550nm WDM with (ISO>45dB).

For access networks we have 1xN high power couplers, 2.5G and 10G PON WDM, as well as optical switching with a range of switch technologies to suit specific design needs. High power EDFA components to enhance distribution are also available. ■

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Compact Semiconductor-based Laser Modules

Popular Source for Raman Spectroscopy

WEB UK67-0854

LASER COMPONENTS can supply compact semiconductor-based laser modules, which offer many advantages over traditional gas lasers. Both wavelength stabilised and power stabilised modules are available.

The NovaTru Chroma range is a great example of a wavelength stabilised source, which utilises a high performance Volume Bragg Grating to enable excellent wavelength stability (± 0.5nm), which is virtually temperature independent (typically 0.01nm/°C).

The NovaTru Chroma 785nm SLM module is a very popular source for Raman spectroscopy with output power options ranging from hundreds of milliwatts up to 1.5W. The NovaTru Chroma 633 SLM is the perfect drop-in replacement for HeNe lasers, offering up to 50mW of stable power at 632.8nm.

A variety of other wavelengths are available making these compact module sources ideal for other applications such as, flow cytometry, semiconductor processing, fluorescence excitation and more. Various fibre coupled and free space output options are available, as are collimated lenses, which can supply TEM00 Gaussian beam profile if desired. The operating voltage is only 5V and a modulation of up to 100kHz can be achieved. ■

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