PHOTONICS NEWS

Company Newspaper of LASER COMPONENTS (UK) Ltd

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#64 ▪ 04|2020

Quantum Communication

Photonics in Space

Quality Assurance

New Products

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iXblue PHOTONICS

Quality Assurance

4 **Metrology Brought to the Shop Floor**
Portable laser-based gap measurements overcome manual errors in turbine engine maintenance

Photonics in Space

8 **Quantum Satellite Communication**
Single photon avalanche photodiodes join the race to develop new encryption methods

12 **Breaking with Traditional Design Rules**
Lasers must achieve specific design requirements to survive the rigours of space

14 **Is there Life in Space?**
Fibre optics transmit real-time spectral data of biological samples aboard ISS

Product News

16 **Keep Up to Date**
Products from
LASER COMPONENTS and Partners

Dear Colleagues

As we enter uncertain times with global events impacting us all, 2020 has nevertheless started well with us so far exceeding our target. Even though last year ended below our optimistic forecast, we grew in terms of staff and products. Furthermore, the LASER COMPONENTS Group announcement last May of the brand new IR factory in Chandler Arizona is well underway. Completion is expected later this year. Investment remains strong and we will adapt to the challenges, as we have done over the last 38 years.

In this issue of Photonics News, we include features from the quantum world, quality assurance and space communication, and how our products are helping advance these technologies. We excitedly present articles on how our machine vision laser diode modules keep aeroplanes flying reliably, how our single photon counting modules (COUNT®) are used in quantum computers, and how laser diodes and fibre optics are used in space applications. We include a range of popular and new components for laser beam waist measurement, extremely bright white light sources, UV-C LEDs, FTIR pyros, a 4-way PSD switch, novel laser safety curtain closing systems, FO hermetic feedthroughs for harsh environments, EDFAs and fibre amplifiers, optical filters and more. However, if you seek something else, please either look on our website or just contact us.

Whilst being mindful and observing the PHE advice on the coronavirus, we also plan to exhibit at many of the traditional photonic events throughout the year, focussing on the premier UK event SPIE.PHOTONEX in October in Coventry, in which we plan a surprise display so do come along.

Yours sincerely,

Chris Varney

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

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What Keeps us Flying

Measuring Large Engines for Small Gaps

Nowadays, turbines are the most common means of propulsion for commercial airplanes. After decades of research and continuous optimisation, the turbofan has established itself as the most efficient turbine engine for speeds between 500km/h and 1000km/h, which is the most common travelling speed for commercial jet aeroplanes. ➔

They only seem to be a small part of the plane when you see them attached to the wings, but standing on their own, they are gigantic pieces of technology. The fan of an Airbus 350 engine, for example, has a diameter of 3 metres – almost twice the size of the average human. These fans are among the most prominent – and most important – parts of the entire engine. It is their job to "suck in" the air, which is then compressed and accelerated by the turbine to produce the jet stream that makes the airplane fly.

Development and construction of aircraft engines is a time-consuming and expensive process. Therefore, airline companies try to keep them in operation as long as possible. Runtimes of 30 years are common. To allow this, the demanding security standards of the airline industry demand each turbine to undergo a strict maintenance schedule. In 2015, almost 25 billion US-Dollars were invested in maintenance, repair and overhaul (MRO) of aircraft engines. Experts claim that this sum will reach 46 billion Dollars by 2025. Still it is more cost-effective to invest in MRO instead of replacing older engines with new ones. It goes without saying that the highest quality standards apply for such a vital piece of technology. Construction and maintenance demand the utmost precision.

With parts as carefully designed as turbine fan blades, any deviation from the original layout may have grave consequences. At the same time, they are among the most highly stressed parts of the engine. Even though they are made of the lightest possible materials their considerable weight and rotation speeds of several thousand rounds per minute make them subject to huge centrifugal forces. Even small particles may cause substantial damage and during flight they are often exposed to harsh environmental conditions such as sub-zero temperature. Humidity and the sulphurous residues of fuel combustion lead to an increased danger of corrosion. All these factors may cause the blade to lose its initial shape.

The slightest change in the clearance gap between the fan blade and the surrounding casing may cause inefficiency, unreliability and noise production. Until recently, this distance was measured by hand using a slip or taper gauge. Naturally, this method was time-consuming and prone to inaccuracies. More accurate and consistent results can be obtained using the laser-based GapGun. British specialists at Third Dimension developed this specialised gap measuring tool using MVnano line laser modules by LASER COMPONENTS. It has been successfully deployed by leading aeronautics engine manufacturers for both gap and surface measurements. It is also possible to take radius measurements on the

© Third Dimension

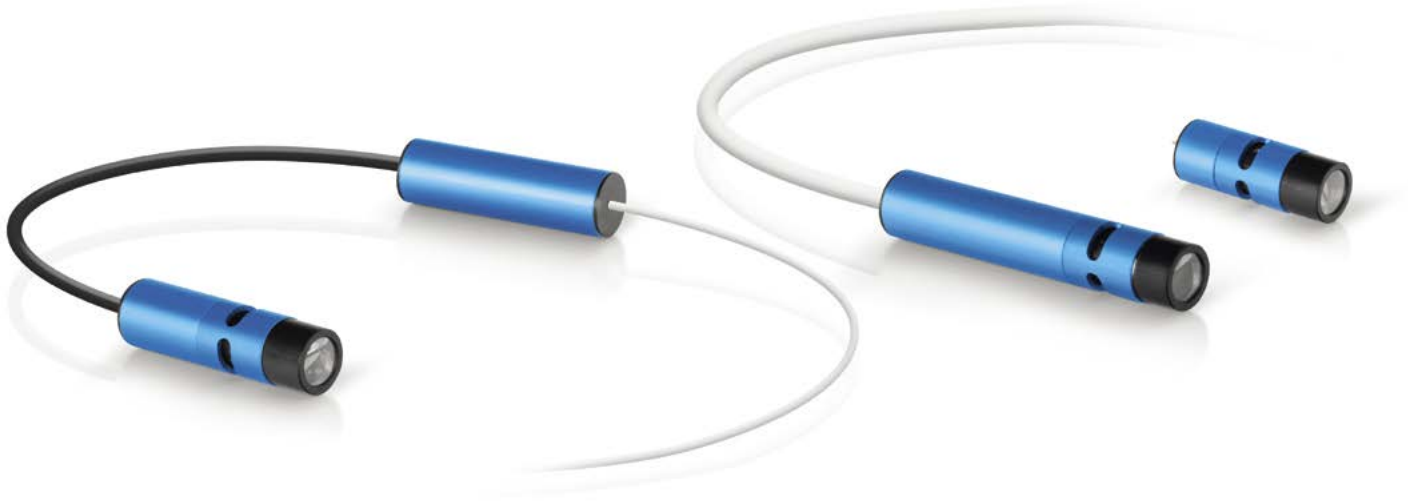
The portable gap measuring system GapGun with laser triangulation considerably reduces the working time and the costs of the manufacturing processes.

© istock.com/AntonMatveev

trailing and leading edges of the blade – including form measurement. The output from the GapGun can be a simple go/no go decision, as recorded measurements are compared to acceptable limits, or the profile can be exported as a point cloud, which may be imported into a CAD program to compare measurement data to the nominal values. In industry applications reliability and repeatability of the results were thus improved by a factor four.

Originally designed as a portable device for quick gap measurement, the GapGun is based on laser triangulation. A laser stripe is projected across the surface of a part to determine the measurable feature. At the same time, an integrated camera system takes images of this static laser line from different angles. Using the known angle between the camera and the projected laser, combined with a range of proprietary optical tuning and analysis steps, the GapGun software calculates the dimensions of the surface covered by the laser. The measured data points form a digital copy, which is then used to analyse the measured surface, instantaneously comparing it with tolerance bands, logging against serial numbers and transferring to a data store. Because a laser is a clean form of structured light, and the recording process is automated, measured data is highly reliable and can be used as a reliable source for quality control and process analytics.

When it comes to aircraft engines, the same method is applied at a fixed position, which allows for the highest possible level of repeatability and consistency. Besides from engine blade measurement, the aerospace industry also uses the GapGun to check welds, as well as the fit of panels in airplane structures for inaccuracies that could cause aerodynamic disturbances or worse: quality problems. ■



Modern Measuring Tools for Industrial Production - FLEXPOINT® MV Series for 3D Image Processing

In Germany, LASER COMPONENTS manufactures custom laser modules; in fact, a special series was developed for use in industrial image processing: the FLEXPOINT® MV series line lasers. FLEXPOINT® laser modules provide the transport industry with new solutions to old measuring problems in production. They are also used as alignment aids and for non-contact measurement. In combination with cost-effective detectors, cameras, and a simple software, laser technologies lead to precise and reproducible measurements in a short amount of time. Where taper or slide gauges were once used, a single instrument is now enough for sustainable measurements.

The FLEXPOINT® MV series laser modules include a wide range of product families that have one thing in common: they are available in three different versions. In addition to the standard module, in which laser optics, laser diodes, and electronics are combined in one housing, it is often necessary to physically separate the optical and electronic elements due to space reasons. Some customers even dispense with factory control electronics in order to conveniently integrate the laser module into their own electronics.

The manufacturer can meet all demands and build the desired versions individually according to the wavelength, power, and beam profile specifications. In order to withstand harsh industrial conditions, the housings are certified up to IP67 (i.e., they are dustproof, preventing the penetration of foreign bodies, and waterproof if immersed only temporarily in water). ■

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Photonic Communications

Single Photons are Paving the Way for the Future

Many consider quantum computing the gateway to a new world of fast-thinking, intelligent computers. While classic computers process information as bits, quantum computing uses so called qubits. As a comparison, the classic bit may be represented by a coin that can only show heads or tails, whereas qubits are more like a coin that spins while it is being tossed. In addition to the equal probability of ending up on either side, it also has other properties such as the spinning speed, the direction it spins, the angle of the spinning axis, and so forth. All these properties may be used to carry data – but only for as long as the coin is spinning. As soon as it lands on the ground it will once again end up with one side up, and the exciting qubit turns into a boring old bit.[1]

Secure Data Transfer

While IBM, Google, and their respective research networks are working on augmenting quantum computing, others have set their eyes on another aspect of the quantum future – namely how it may affect cybersecurity and data encoding.

Quantum computing poses a potential threat as it is capable of rapidly decoding existing encryption methods. One readily available solution is quantum key distribution (QKD).

The first theoretical principles of quantum encryption have been established as early as the 1980s. Most commonly, single photons are randomly put into distinct states of polarisation that are transmitted from an information source (Alice) to a recipient (Bob), where they are re-transferred into digital information.[2]

One of the most secure forms of establishing a trusted connection between Alice and Bob is the use of entanglement. Roughly speaking, there is a magical bond between a pair of photons created as twins, which causes one of them to behave exactly like the other – even if they are miles apart. Scientists call this "spooky action at a distance". With one entangled photon transmitted to Bob, while the other returns to Alice, both the data and code information can be transmitted at the same time.

1 https://www.sciencealert.com/quantum-computers
2 https://en.wikipedia.org/wiki/Quantum_key_distribution

SpooQy-1: Singapore's experimental quantum CubeSat for testing a source of entangled pairs of photons.

Long-Distance Communication Challenges

Using modern fibre technology, QKD may be applied today, but only on a metropolitan level. Due to the optical attenuation of fibres, the signals can only be transmitted for a few hundred kilometres before they are degraded into indistinguishable blabber.

In legacy technologies, optical or electronic repeaters are used to overcome these obstacles; however, on a quantum level these technologies are not likely to be available within the next few decades. Unlike with radio transmissions, the free-air transmission of optical data relies on the so-called "line of sight", which is the uninterrupted line between the sender and the recipient. Therefore, scientists are once again setting their minds beyond the confines of our planet. The attenuation of the atmosphere is far lower than that of an optical fibre.

This means that effective communication is possible over significantly longer distances, given suitable sensitive single photon detectors. An entangled quantum code generated by a satellite in Earth's orbit could be transferred to both Alice and Bob, as long as they are both within reach of the satellite.

In 2017, the Micius satellite of the Chinese Academy of Science was successfully used to transfer a traditional quantum code from China to Vienna, Austria. At the National University of Singapore, scientists are currently working on an entangled quantum encryption device that will fit into a small so-called nano-satellite cube of 11.35cm × 10cm × 10cm.

The aptly named SpooQySat, in operation since June 17, 2019, currently serves as a live demonstration of an entangled photon source in space.

Down on Earth, the detectors on Bob's side have to be able to filter out a single encoded photon from all the surrounding background noise. Usually, scientists employ single photon avalanche diodes that absorb incoming photons and transfer them into electrical signals. Their quality is defined by their quantum efficiency and the ability to block out the background noise. ■

Every Photon Counts

Fundamental Research Supported by Highly Sensitive Measurement Tools

WEB UK64-0290

In quantum information processing, many experiments are conducted using photon wavelengths around 810nm, which is where silicon avalanche photodiodes (APDs) are most efficient. Under the brand name COUNT® NIR, LASER COMPONENTS offers a plug-and-play module with a notable detection efficiency rate of 50% at 810nm – almost 80% at 700nm – and extremely low dark count rates of < 50cps. The device is based on a single-photon avalanche photodiode (SPAP) designed in house that operates in Geiger mode to detect extremely weak light signals.

All in one, COUNT® NIR offers researchers a versatile set of features that combines high photon detection efficiency, a high dynamic range, and ease of use for the most demanding photon counting applications. ■

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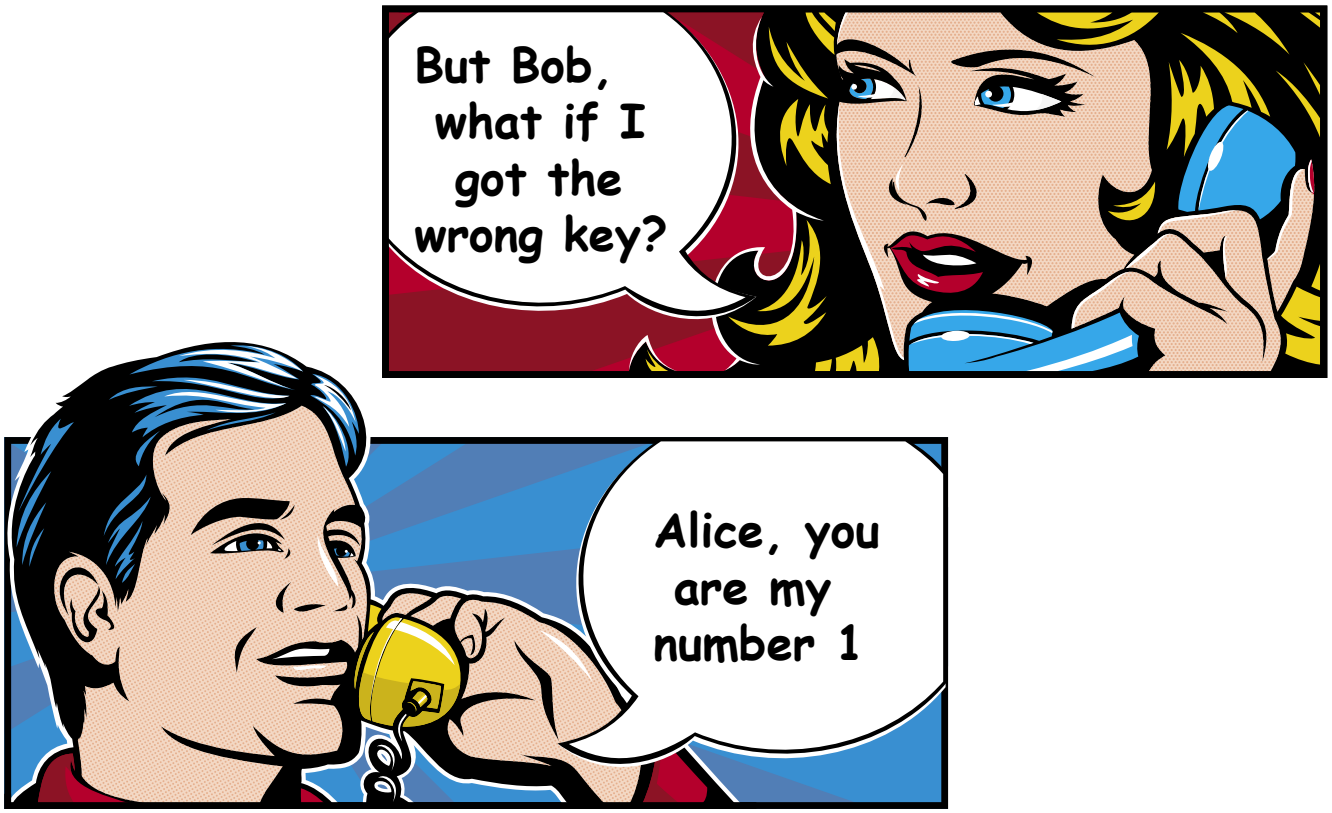


Application Fields for COUNT® Modules

How Quantum Cryptography Works

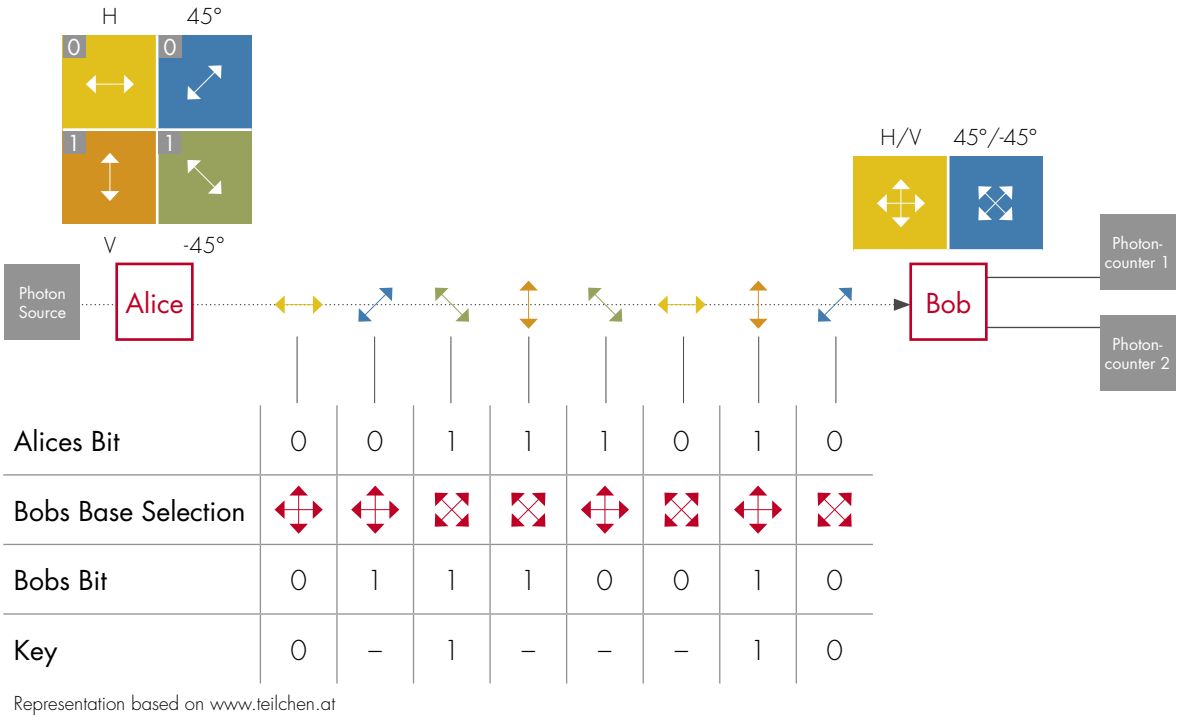
Data security and data exchange are topics with increasing importance. How do you prevent data from being intercepted by a third party? The solution lies in cryptography: the message must be encoded. But what if the key exchange is intercepted? This is where quantum crytography comes into play.

The fundamental idea behind so-called quantum key distribution (QKD) is to use single photons instead of entire photon bundles. This way an eavesdropper (referred to as "Eve" in quantum mechanics) cannot simply divert the photons that are sent from Person A to Person B (referred to as "Alice" and "Bob," respectively, in quantum mechanics). Eve would have to copy and then detect the photons to prevent the interception from being detected by Bob. This is precisely what quantum mechanics renders impossible (the so-called "no cloning theorem").

Figure 1 depicts what key generation for coding and decoding data can look like. This so-called BB84 protocol (developed by Bennett and Brassard in 1984) uses the polarisation of photons as a means of generating a key sequence. Alice selects one of four polarisation states – H (horizontal), V (vertical), +45°, and -45° – and sends such a photon to Bob. She must first indicate which bit value the two orthogonally arranged polarisation states have: 0 or 1. In our example, H corresponds to 0, V corresponds to 1, 45° correspond to 0, and -45° correspond to 1. If Bob receives such a photon, he decides whether to measure based on H/V or 45°/-45° and ultimately makes a note of the polarisation state (and thus the bit value) of the photon. Bob communicates with Alice in the classic sense, and they compare their base selection. This information, which is of no use to Eve because she does not know the exact results, is sufficient for Alice and Bob to determine which bit values they can use for their key[1] .

A further development of the BB84 protocol uses entangled photons, which strongly correlate in their properties, that are sent from a single source to Alice and Bob simultaneously. One such source was developed, for example, by experimental physicists in Prof. Weihs' photonics group at the University of Innsbruck: a pulsed Sagnac source of polarisation-entangled photons[2]. Here a nonlinear crystal is used that produces two lower-energy photons at a wavelength of 808nm from a higher-energy photon at 404nm. The photons are detected using two "COUNT" SPADs by LASER COMPONENTS.

1 https://quantumxc.com/quantum-cryptography-explained/
2 http://www.uibk.ac.at/exphys/photonik/people/parametric-downconversion.html
3 http://arxiv.org/abs/quant-ph/0702262
4 http://arxiv.org/pdf/1008.4593v2.pdf
5 http://arxiv.org/abs/1109.1473



Alices Bit	0	0	1	1	1	0	1	0
Bobs Base Selection	✥	✥	⤫	⤫	✥	⤫	✥	⤫
Bobs Bit	0	1	1	1	0	0	1	0
Key	0	–	1	–	–	–	1	0

Representation based on www.teilchen.at

Fig. 1 Schematic diagram of the quantum key exchange between Alice and Bob

As secure as these methods are in theory, in practice there is a lot of room for error. The most significant sources of error are the single photon detectors that Alice and Bob use. In theory, the available detectors are perfect, identical, and have a detection efficiency of 100%; however, in practice, this is never the case. It is precisely this discrepancy in the detection efficiency of two detectors that quantum hackers use to access the key[3]. An alternative method "blinds" the SPADs with the help of a light pulse and uses the "blind time" of the detector to intercept information[4].

Thanks to the identification of sources of error by quantum hackers, research groups have been able to work on approaches for solutions to these problems and develop a "measurement unit-independent" version of the QKD[5]. The industry can also contribute to making the methods more efficient and precise. The constant exchange between research and industry is thus extremely important. ■

New Phase of UK Quantum Secure Communications Research and Development

In 2019, the UK Quantum Communications Hub was awarded further funding of approximately £24M to deliver its vision of integrated quantum secured communications. Achievements so far include the establishment of the UK's first Quantum Network, a ground-breaking chip-to-chip quantum secured communication system for data encryption and other applications, the delivery of handheld or "commercial" short-range, free-space systems, and major advances in next generation quantum communication technologies. The theme of the next phase of the Hub is one of expansion, delivering quantum secured communication technologies at all distance scales and offering a range of applications and services with the potential for integration with existing infrastructure. ■

Link:
https://www.quantumcommshub.net/news/major-funding-announcement-heralds-new-phase-of-uk-quantum-secure-communications-research-and-development/

Long-Lifetime Laser Diodes for Space

Adam Erlich, Sheaumann Laser Inc.

WEB UK64-1450

Lasers must achieve specific design requirements to survive the rigours of space and still be cost-effective.

There has been a flurry of announcements in the news recently about low-Earth-orbit satellite constellations, which are primarily expected to be able to provide wideband internet anywhere in the world. Many of these satellite networks will require lasers that are cost-effective and able to survive the rigours of space. Missions to the moon and planets typically require high bandwidth to accommodate such scientific demands as hyperspectral imaging. To provide sufficient power and signal strength to ground stations, custom high-power laser diodes may also be necessary for some space missions. Consequently, long-lifetime lasers for harsh environments are becoming increasingly important. There are several key factors related to designing a laser module for long life in space.

The Rigours of Space

The extreme environmental conditions found in space push the physical limits of nearly every scientific technique, process, and component. For a spacecraft to succeed, all components, including lasers, must not only survive these conditions but maintain performance as well. Space organisations will frequently choose a laser based on its ability to penetrate the atmosphere and transmit through water vapour. Coincidentally, these wavelengths are similar to traditional telecom wavelengths, but standard telecom packages are not designed for the rigours of space.

When lasers travel into space, they may be required to operate for two-plus decades without repairs or recalibration. They will be exposed to temperatures ranging from -55 to 85°C, from the chilling darkness behind the Earth to the extreme heat of the sun. They will also be exposed to high mechanical stresses, including severe shock and vibration. Designing a laser for success in space is particularly demanding because size, weight, and power must be as small as possible to minimise launch cost.

Thermal cycling is an area that challenges laser manufacturers because the different thermal expansion coefficients between the materials within the package can result in varying power levels coupled to the fibre. Over time, these differing expansion rates cause the package to shear itself apart. The ability of the laser to prevail and survive in a hostile environment depends on reworking the way a diode laser chip is designed and mounted within a package. Long-lifetime lasers are required to survive thousands of temperature cycles; even military-grade laser diodes typically cannot survive more than 500 cycles. Ultimately, the characteristics of space provide the ideal environment to test and perfect extreme reliability.

When lasers travel into space, they may be required to operate for two-plus decades without repairs or recalibration.

The Metal Stack

In a typical laser diode design, there are several layers of various metals and solder between the laser chip and the package. The solder connects the chip to a submount, which is connected by another solder to a base mount, which in turn is connected to the package by another layer of solder (Figure 1). Each layer represents a potential thermal expansion mismatch, and when subjected to extreme cycling tests, the metal matrix of the solder can break apart.

Thus, materials should be selected based on three key criteria:

1. high thermal conductivity to remove heat from the die;
2. compatible thermal expansion through the metal stack; and
3. material strength to maintain structural integrity under high shock and vibration.

Through effective design, thermal stress between the layers can be minimised. This type of laser module is able to survive over 2000 temperature cycles and the high g-forces and vibration profiles associated with launch.

The Laser Chip

When lasers travel into space, they may be required to operate for two-plus decades without repairs or recalibration.

An essential part of achieving long lifetime is optimisation of the thermal performance of the die itself. If a chip becomes too hot, it will be stressed and burn out over time. The better the heat dissipation, the longer the life of the laser.

Designing the best metal layers and thicknesses to avoid high thermal impedances between the layers is critical. It requires multiple layers of metal to be deposited on the gallium arsenide (GaAs) chip that thermally couples the die to the solder and connects it to the submount (Figure 2). If layers are not correctly chosen, heat reflects back to the chip. Although modeling tools are available to help with this task, decades of experience are necessary to master this art; the technique is so subtle, it has not been fully captured in modeling tools. The chip must reliably operate at very high junction temperatures.

Performance

In addition to surviving the harsh environment, the laser module must also maintain its optical performance. Thermal expansion moves the fibre relative to the aperture of the die and reduces the light coupled into the fibre. To maintain consistent power into the fibre, the system must be made less sensitive to this movement.

One novel approach to reduce sensitivity requires a change to the quantum well structure of the die to alter how the light is emitted from the aperture. This results in higher coupling into the acceptance angle of the fibre.

An in-house packaging and laser die design system can enable the creation and fabrication of unique die structures. By altering the physical properties of the beam emitted from the die, it is possible to maintain consistent power into the fibre across the required temperature range.

Hermeticity

Beyond thermal management, package hermeticity also represents a challenge. High levels of hermeticity are directly related to laser lifetime. Telcordia specs are two orders of magnitude lower than what is required for a laser to survive for 25 years in space. One way to achieve these levels is with a novel process that seals the snout of the package together. The ability to test the package for fine and gross leaks at these levels requires advanced procedures.

Because innovation is required for a laser module to succeed in space, traditional design rules will need to be broken and the designs remade from scratch. A company's ability to alter its laser diode design and fabrication, along with its ability to process and package in-house, are keys to success. ■

Adapted from the August 2019 issue of PHOTONICS SPECTRA

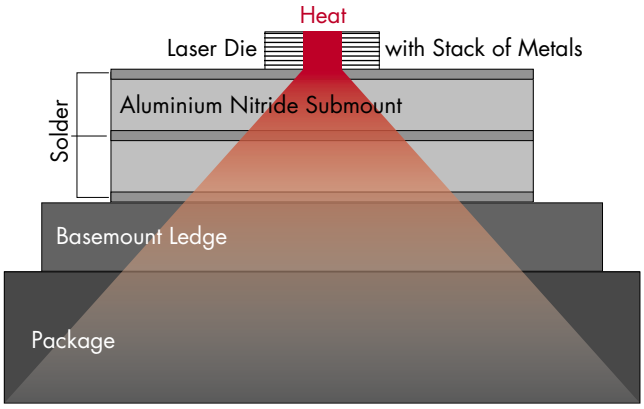


Fig. 1: Die, Submount and Housing

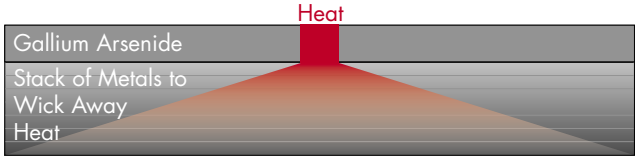
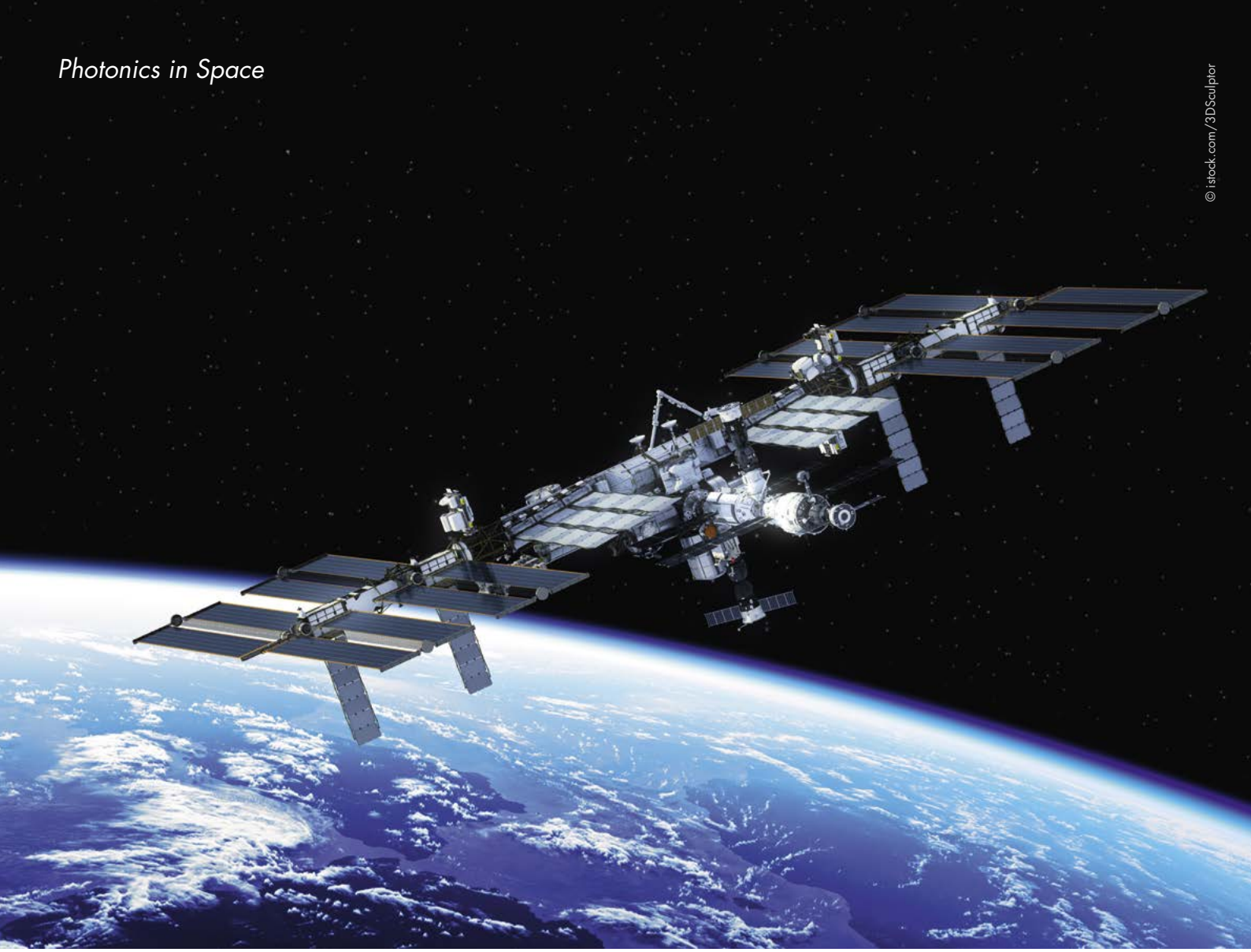


Fig. 2: Detailed view of the Laser-Die



Fibre Optics in Space

Optical Switch Proves its Worth Aboard ISS

WEB UK64-0110

All components for use in space must undergo intensive and detailed testing until their space suitability can be determined. The qualification of equipment and components for space missions is, therefore, a long and costly process. To reduce the mission risk, it is useful to have a so-called technology demonstrator, to be tested early and under real conditions. One current example of this is a fibre optic switch supplied by LASER COMPONENTS to the space company OHB, which was qualified for a space experiment aboard the International Space Station (ISS). In the future, it will be used in an Exobiology Facility.

Space Research

The European Space Agency is developing a novel Exobiology Facility to be accommodated outside the International Space Station (ISS). Exposure platforms like the Exobiology Facility in Low Earth Orbit (LEO) – with the possibility for long-duration solar exposure – are ideal for investigating the effects of solar and cosmic radiation on various biological and non-biological samples. Up to now, the exobiology and space science research community has successfully made use of the ISS via the EXPOSE Facility to expose samples to the space environment with subsequent analyses after returning to Earth.

The new platform will combine the advantages of the ISS, i.e., long-term exposure and sample return capability, with near-real-time in-situ monitoring of the chemical or biological evolution of samples in space. In particular, ultraviolet-visible (UV-Vis) and infrared (IR) spectroscopy are considered to be key non-invasive methods for analysing the samples in situ. To acquire the spectra of many samples, which are necessary for statistical reasons, one of the key instruments is an optical fibre switch, combined with the ultraviolet-visible spectrometer.

Optical Technology Demonstrator

SPECTRODemo has been developed as a precursor demonstrator to increase the maturity of the complete optical chain, i.e., the fibre switch and spectrometer. The payload was launched on April 17, 2019 and operated continuously until August 9, 2019. The technology demonstrator was operated aboard the ISS within the ICE Cubes Facility – a small modular container which measures 2Ux2U, where 1U=10x10x10cm^3.

The demonstrator provides useful information for the upcoming development of the Exobiology Facility flight model, especially with respect to the operation, durability, and reliability of the fibre switch.

In the fibre switch concept, each cell is associated with its own dedicated multimode optical fibre. A switch unit is used to select the fibre that is measured by the spectrometer, which allows a higher flexibility in sample handling in a compact design. The configuration of SPECTRODemo supports continuous acquisition across six channels, with each channel recording a spectrum from a defined LED source through a calibrated neutral density filter with a fixed absorbance value.

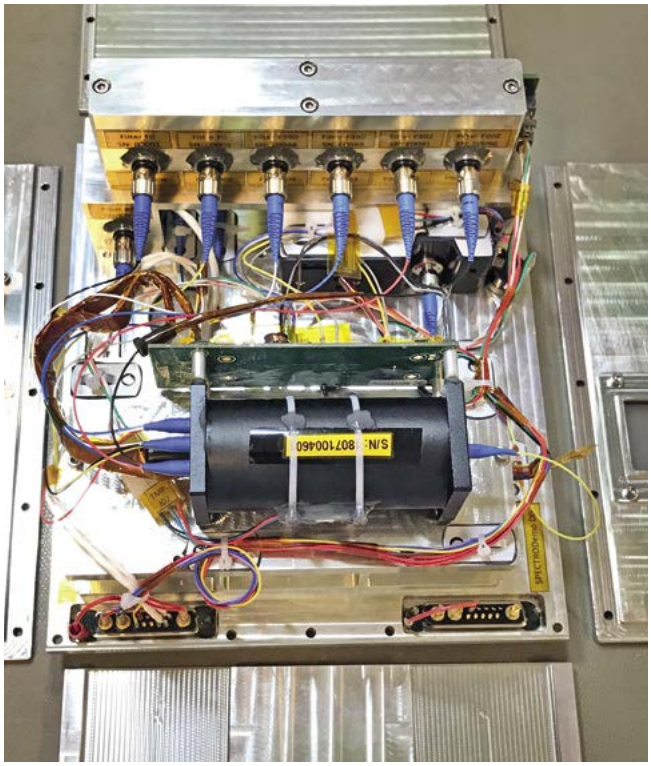
The main objective is to assess the reliability of the system and potential modifications to assure repeatable measurements and suitability for the harsh environment of space. Consequently, an environmental test campaign was performed to evaluate whether critical components can survive the launch and the space environment. The fibre switch underwent vibration and shock testing and passed successfully. Additionally, the device experienced a thermal-vacuum test in which the setup was connected electrically and optically to equipment outside the chamber to verify the system performance during testing. Overall, eight cycles between -25°C and 60°C were performed. Performance was measured at extreme temperatures, without exhibiting any malfunctions in this case as well.

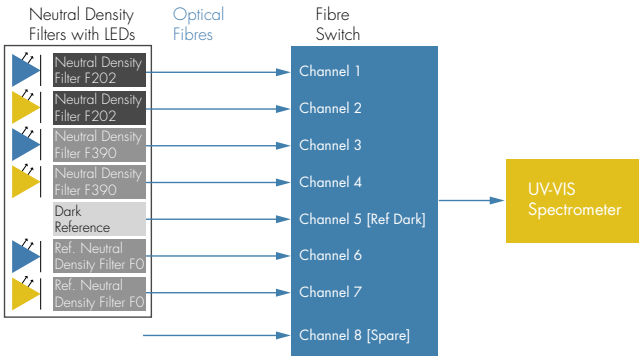
What's Next?

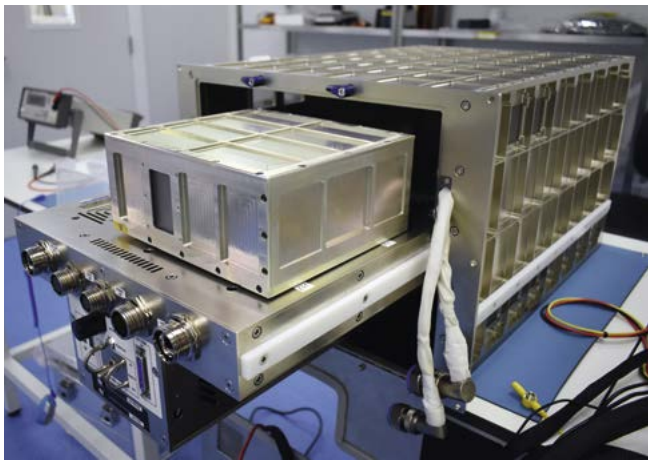
The payload returned to Earth on August 27, 2019 via Space-X 18. Since then, further investigation has been performed at OHB, mainly focused on the improvement of the stepper motor chain and high vacuum lubricants for a more accurate acquisition and calibration position repeatability. Furthermore, the fibre switch assembly, including the electronic board, will be assessed versus the radiation environment to determine the degradation of the optical components (e.g., fibres) and the suitability of the electronic parts.

The next step will be the development of a customised version with 1x55 channels to be used for the Exobiology Facility. ■

Internal structure of the SPECTRO Demo:
a demonstrator of optical technologies for space research.







Our Products

BWA-CAM 20/20™

The World's First 'Plug-and-Play' Solution

WEB UK64-0032

LASER COMPONENTS would like to introduce the BWA-CAM 20/20 to its range of beam analysis equipment. Much like the existing Beam Waist Analyzer (BWA) products, the system allows real time laser beam analysis and ISO compliant measurement of M^2 and other spatial metrics. The BWA-CAM 20/20 however is the world's first 'plug-and-play' solution offering ISO compliant real time M^2 measurement, with no complex alignment needed for high power CW and pulsed lasers.

The user simply centres the system such that it is roughly perpendicular to the beam, enters the laser wavelength, effective focal length of the lens being used and the distance from the lens to the front of the BWA-CAM 20/20, and the real time measurement is ready.

The M^2 measurement is made in a fraction of a second and takes no more effort or training than measuring laser power for example.

The BWA-CAM 20/20 is available now. ■

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Visible and NIR Laser System Solutions

For Your Laser Source Requirements

WEB UK64-0830

Necsel have become a leader in visible and NIR laser system solutions thanks to their patented Volume Bragg Grating (VBG™) technology, for which the company has been awarded over 35 patents. These VBG elements stabilise laser diode wavelength and produce a very narrow line-width with minimal temperature dependence. The use of VBGs also improves laser diode efficiency and lifetime. Necsel offer a wide range of stabilised laser modules with wavelengths spanning the visible and NIR spectrum.

The SLM Single Longitudinal Mode laser series offers ultra-stable output power, very narrow spectral linewidth and high wavelength stability. The output can be fibre coupled or free space.

The PLM series are power stabilised laser sources in a compact and rugged enclosure ideally suited for applications demanding stable and high power multimode optical output. The PLM features automatic stabilised power control, utilising the internal TEC and monitor photodiode. ■

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White Light Laser Sources

SMD Laser Sources with 450 Lumens

WEB UK64-1740

The LaserLight SMD now offers manufacturers of semiconductor-based lighting solutions a powerful white light source for directional light. With more than 1000 Mcd/m², this light source can achieve a luminance of up to ten times higher than ordinary white LEDs. This enables particularly efficient lighting solutions with a small form factor. In combination with a 35-mm optic, a beam angle of less than 2° can be achieved. The 7mm SMD package is provided on a star-shaped connection pad with an integrated heat sink; thus, the component can be easily integrated on different circuit boards.

This white light source provides the light for LASER COMPONENTS' ALBALUX® modules. ■

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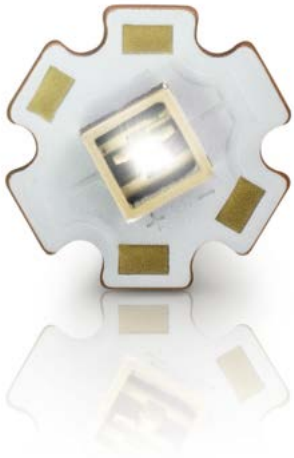

UVC LEDs from Bolb

New Methods of Disinfection

WEB UK64-0810

Bolb, Inc. is our reliable new partner in UVC LEDs. All the products offered by Bolb, a manufacturer based in California, are now available in stock at LASER COMPONENTS throughout Europe. Bolb has specialised in the UVC wavelength range.

The company's flagship product is its germicidal LED (GLED), which provides significantly higher performance than similar products from other manufacturers. In important applications such as water treatment and the prevention of hospital germs, new processes for the treatment of surfaces, water, and air are possible. ■

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Pulsable IR Emitters

EVF-555X

WEB UK64-0310

LASER COMPONENTS has a long and successful partnership with Helioworks, a world leading manufacturer of infrared emitters. The EVF-555 is a pulsable black body infrared emitter in an industry standard TO-39 with 1.6 Watts input power at a peak temperature of 700 degrees centigrade. The radiating element is vertically orientated and centred in a parabolic reflector so that the radiation from both sides of the elements is captured and directed outwards. The filaments are made using ultra-thin nichrome metal strips with a very short thermal time constant, in short they heat up and cool down very rapidly.

The package can be sealed with a choice of calcium fluoride, sapphire or zinc selenide window.

Also available are a range of continuous IR emitters using Kanthal filaments and again fitted with an internal parabolic reflector, these devices offer a low voltage DC input.

All the emitters that we supply provide robust sources for spectroscopic applications. ■

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Lithium Tantalate Pyroelectric Detectors

FTIR Spectroscopy

WEB UK64-0330

Infrared detectors used at the heart of the FTIR spectrophotometer must have the following characteristics: wide spectral response range, high sensitivity, wide frequency bandwidth and good linearity. LASER COMPONENTS offers lithium tantalate pyroelectric detectors that use a metallic black absorber to improve the modulation performance of these devices.

The coating works in a similar fashion to an anti-reflection coating. Data shows that over the spectral range of 2–25 microns, 93% of the incident infrared is absorbed. This approach significantly improves the performance of lithium tantalate devices at high frequencies. From our research and production facility in Arizona we supply customers all over the world with these industrial grade thermal detectors. ■

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PSD Switch

For Use with the SEEPOS Signalling Processing System

WEB UK64-0230

The SiTek PSD switch allows for the connection of up to four PSDs (position sensitive detectors) to the SEEPOS signal processing system. Simple rotation of the dial at the front of the switch allows the user to easily select the required type of PSDs to use for a specific type of measurement from one to four PSDs. Used with the SEEPOS signalling processing system, a wide variety of PSDs and PSD holders are available to create a complete, plug and play style solution for most kinds of measurement related applications.

This versatile SEEPOS system is complete with software, high speed electronics, USB interface and a large dynamic range which can be used to detect laser spots from nW to mW in both CW and modulated modes for real time display and data analysis. ■

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Laser Safety Curtain Systems

Hi Vis Laser Safety Curtain Door

WEB UK64-0540

Enclose your laser work area with a laser safety curtain from Kentek. The Flex-Guard® laser screen materials offer protection to 200 Watts/cm². Choose Ever-Guard® for the ultimate in clean room friendly laser beam protection with a rating of up to 1200 Watts/cm². All laser barriers are built to exacting specifications with durable components and will provide years of service. Laser curtains are available in stock to fit many rooms and can be manufactured to meet custom specifications. Laser work environments often have low ambient light, which can make it difficult for personnel to locate entry/exit doors. With a Hi Vis Laser Safety Curtain Door, entry and exit points are easily identified. Our Hi Vis Laser Safety Curtains are sewn with highly reflective silver strips to mark the edges of the curtain doors.

In addition, LED indicator lights can be used at the curtain door. When coupled with Entry/Access Control Systems, the lights are red when laser radiation is present and green when it is safe to enter.

These new products are available now for your custom laser safety curtain solution. ■

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Reliable Hermetic Feedthroughs for Extreme Environments

Standard and Custom Versions Available

WEB UK64-0135

Passing optical fibres through extreme environments and between ambient and harsh conditions is a non-trivial exercise. LASER COMPONENTS' solution for this engineering hardship is a range of hermetic feedthroughs - standard and custom-made.

Hermetic fibre-optic feedthroughs allow for easy delivery of optical signals through a physical barrier (such as the panel of a chamber), the purpose of which is to isolate an environment from another environment and to prevent any leakage from one side of the barrier to the other side.

Two places where a feedthrough must maintain a seal are at the barrier itself, and at the hole where a fibre is passing through. Not maintaining a tight and hermetic seal in those two areas can result in a critical system failure. In order to provide a world-leading hermeticity, seals are maintained with an internal fibre rod, identical to the fibre used upstream and downstream, as well as a top-quality flange and gasket system. These allow us to meet stringent sealing and leak tightness requirements.

When using our feedthroughs one can achieve hermeticity in various extreme environments, ie. one side can be high pressure (up to 1000 bars) while other can be high vacuum; the temperature on both sides can be either extremely elevated (600+°C) or extremely cold (0.5K); either side can be extremely corrosive or/and radiative.

Depending on the application, the design of a feedthrough can be significantly different, ie. single or mutli-fibre feedthrough; fixed or reconfigurable; bulkhead or inline. Particular attention must be devoted to both the choice of materials and the choice of the sealing technology. ■

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Fibre Lasers and Amplifiers for your Application

Available in Continuous or Pulsed Versions

WEB UK64-0190

LASER COMPONENTS would like to introduce its range of Keopsys by Lumibird fibre amplifiers and fibre lasers from 0.35µm to 2µm wavelength. These products are available either in continuous or pulsed versions with some models capable of achieving narrow linewidths with very low phase noise and RIN.

We are proud to service a variety of applications including LiDAR, spectroscopy, optical component testing, medical and cold atoms.

We have recently noticed an increasing demand for Erbium doped fibre amplifiers in quantum technology due to the heavy funding within the UK and research in this field such as cold atom focusing on accurate atomic clocks.

Our robust EDFA is appealing to this research and can offer up to 42dBm of saturated output power with a greater reliability. Furthermore, knowing that atomic cooling needs extremely stable laser with a narrow linewidth, we can offer a capability for a linewidth <100kHz. Option of single mode fibre or polarisation maintaining fibre is available.

Quality benchtop platforms or modules are available depending on your requirement. ■

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OPTICAL FILTERS

OPTICAL
FILTERS 190nm – 20µm

Filters
- Bandpass and Multiband
- Longpass
- Shortpass
- Dichroic
- Neutral Density
- Notch (Rejection Band)

Markets and Applications
- Life Science/Biomedical
- Astronomy and Aerospace
- Defence and Security
- Commercial and Industrial

Capabilities
- Custom Coating Design
- Mechanical and Optical Fabrication
- Testing and Metrology

WEB UK64-0850

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UPCOMING EVENTS

Photon 2020
University of Nottingham
Sept. 01–03, 2020
Booth 35

SPIE. PHOTONEX
Ricoh Arena, Coventry
Oct. 07–08, 2020

LASER COMPONENTS