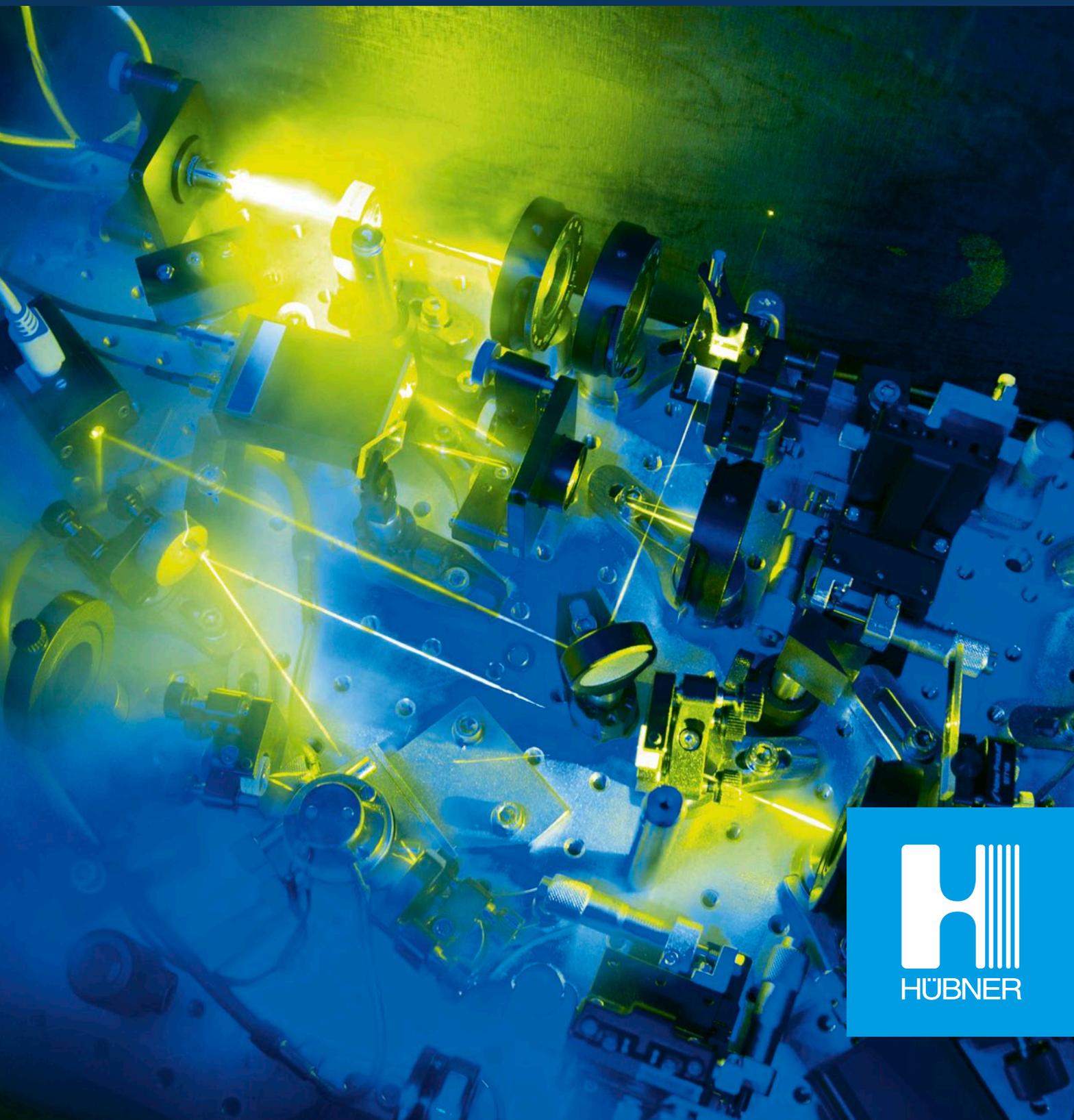


Laser, Terahertz and High Frequency Technology

HÜBNER Photonics | Coherence matters.



Mobility. Materials. Photonics. | united by passion.

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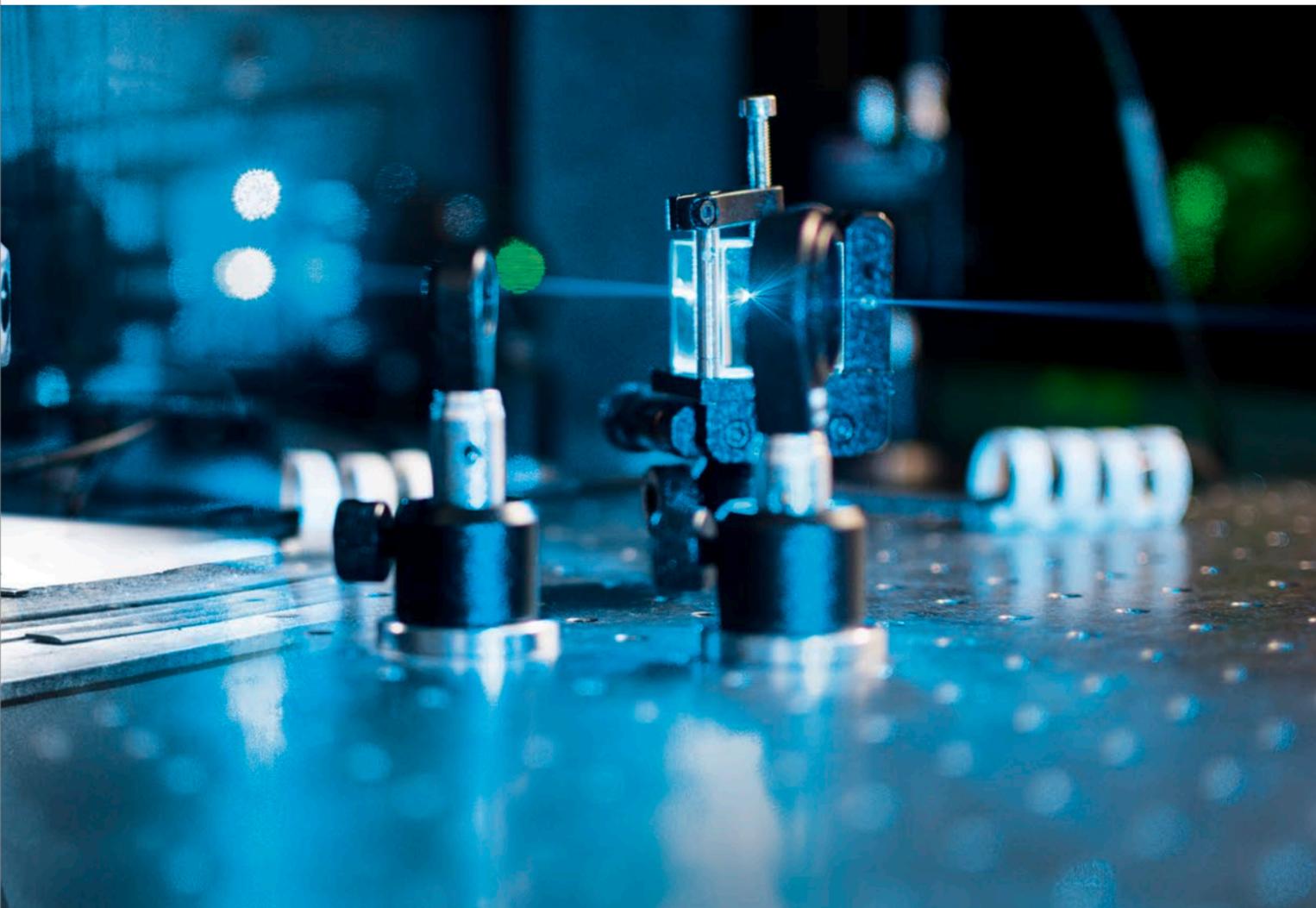
HÜBNER Group
Mobility. Materials. Photonics.
united by passion.

Since the beginning in 1946 when Kurt Hübner founded the company, HÜBNER has been shaped by a spirit of enterprise, inventiveness and innovation. Today it continues to be this same passion for new solutions that drives the company and its employees. Again and again over the years, new concepts for new products and new markets have been developed and implemented.

It is on this basis that HÜBNER has become the company that it is today: A comprehensive system supplier for transportation technology and the worldwide leader for gangway systems (Mobility), a well-recognized provider of solutions for rubber products, plastics technologies and elastomer-coated industrial textiles (Material Solutions) as well as a promising company in the field of laser, terahertz and high frequency technologies (HÜBNER Photonics).

Today the HÜBNER Group consists of more than 20 different companies and has more than 2,800 employees around the world. And HÜBNER products continue to stand out with their high-quality workmanship, their superior convenience and their distinctive durability. This high level of quality is to be found in all of the Group's business sectors and throughout the entire product range.

This all comes together in our company slogan:
Mobility. Materials. Photonics. | united by passion.





HÜBNER Photonics | Coherence matters.

“Two wave sources are perfectly coherent if they have a constant phase difference and the same frequency.” In a way, this condition sums up everything HÜBNER Photonics stands for.

We not only make game-changing lasers and light sources, but also rethink all kinds of other wave technologies including terahertz imaging as well as high frequency emission and radar. The proven corporate values of the HÜBNER Group are brought together with innovative ideas and top-notch technologies for the whole electromagnetic spectrum.

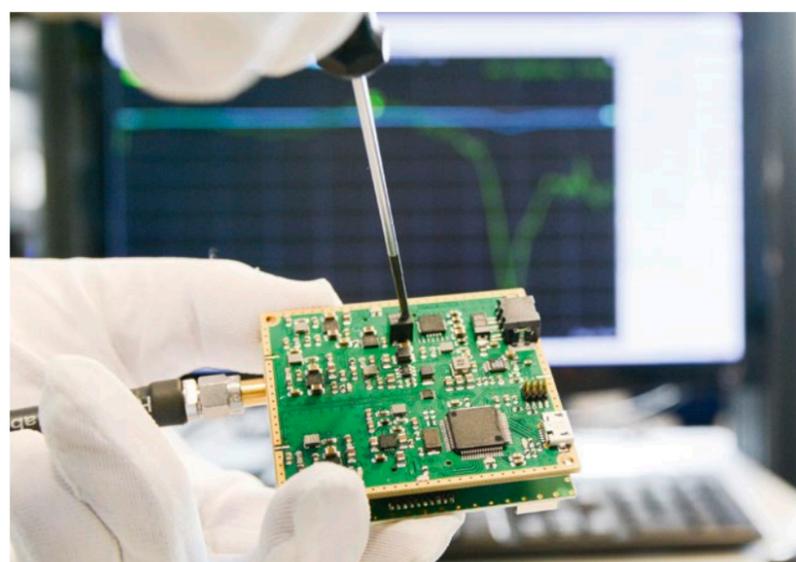
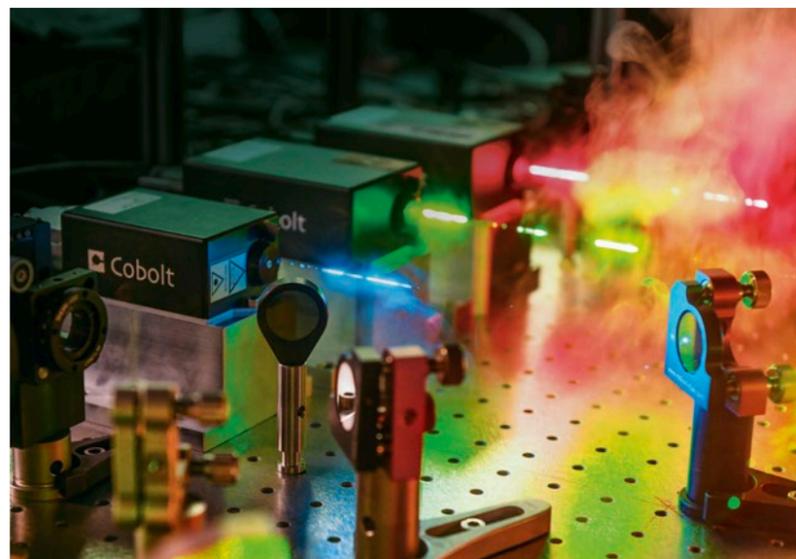
Coherence for us is far more than the perfect interaction of waves. It is the basis of our daily work and the fundament on which we build our business and our relations within our company and with our partners.

Coherence matters for our products – since we are committed to supplying reliable, innovative high performance photonics solutions.

Coherence matters in our attitude – our teams are built up by world-leading expertise in photonics, moving as one.

Coherence matters in our customer relations – we operate in phase with our customers' needs and therefore stand out by maximizing customer value.

Coherence matters is in our genes and our spirit – all day, every day.



LASER TECHNOLOGY

Laser technology

High-performance lasers for science and industry

HÜBNER Photonics offers a wide assortment of high performance laser products which meet the ever increasing opportunities for lasers in science and industry. This portfolio includes compact single frequency CW lasers, single frequency tunable CW lasers, multi-line lasers, diode lasers, Q-switched lasers and laser combiners covering the full UV-Visible-MidIR spectrum. Main application markets are to be found in spectroscopy, holography, quantum optics and many others. The combination of competencies across the HÜBNER Photonics division facilitates volume manufacturing of exceptional laser designs with unparalleled reliability. This means that life science and analytical instrument manufacturers now have a supplier they can really rely on and research scientists have a reputable source for lasers to meet their needs.

TERAHERTZ TECHNOLOGY

Terahertz technology

An innovative tool for the detection, analysis and imaging of materials

Outstanding ease of use, extremely compact and entirely safe for persons and materials – these are the characteristics of the terahertz systems developed by HÜBNER Photonics on the basis of cutting edge research. Using terahertz waves, the new devices make it possible to visualize concealed contents in various situations. For example, in letters and packages suspicious substances and objects can be detected immediately and analyzed and visualized with hyperspectral imaging within seconds. The HÜBNER Photonics imagers and spectrometers are therefore especially well suited for use in mailrooms and other settings where security can be an issue. The devices also offer unique capabilities for non-destructive quality control in connection with industrial production.

HIGH FREQUENCY TECHNOLOGY

High frequency technology

From basic research to standard components

The HÜBNER Group company HF Systems Engineering (HFSE) develops and applies high frequency technology towards industrial applications and opens new fields of application. High frequency radar may nowadays be applied to add value to existing process control or measurement methods, either substituting them, or rendering additional information. Automated production, employing radar for quality control, will profit from higher efficiency, better quality and security for workers and machinery. However, radar is only one of many techniques where high frequency engineering plays an important role and HFSE is prepared to serve a growing community of users to be found in telecommunication, navigation, meteorology and the vast field of science. Thus the product range is diverse, ranging from standardized passive and active components to entire turn-key systems. The customer approaching HFSE will experience dedicated and reliable consulting, substantiated by experience.

History A bright way into the future

Again and again, HÜBNER has been a driving force for technological progress. The family-owned company places a high priority on the innovative value and quality of its products and concepts – from the initial idea to the market-ready product.

In the field of laser, terahertz and high-frequency technologies, HÜBNER has defined the standard again and again and set the course for further developments. HÜBNER made a commitment to basic research early on and began to cooperate with leading scientific institutes. The company secured further know-how through its integration of the Swedish laser manufacturer Cobolt in 2015.

Even before the company's activities had been combined into the new business segment HÜBNER Photonics, two in-house developments received the renowned photonics Prism Award – the tunable laser C-WAVE as well as the terahertz spectrometer T-COGNITION. With these and other innovations such as the T-SENSE imager or a range of radar products known for their exceedingly precise measurement readings, HÜBNER Photonics is opening up more and more applications for those trend-setting technologies.

In addition to its involvement in basic research, HÜBNER Photonics is also committed to ensuring the utility of its developments for customers in the real world. Many products and solutions are developed in close cooperation with industrial customers and with an eye on their specific needs. And these products also undergo continual enhancement and improvement based on the demands of commercial use. In addition, all customers benefit from the wide cross-industry know-how of the HÜBNER Group.

Production of rubber tubing connections as gangways for railway passenger cars of the Deutsch Bahn and production of the folding bellows for articulated buses

1952

1946 Founding of the company by Kurt Hübner in Kassel, Germany.
Start of rubber production activities

Diversification from HÜBNER into terahertz technology in collaboration with Fraunhofer Institute

2006

2000 Founding of Cobolt AB

Diversification into laser technology in collaboration with Fraunhofer Institute

2012

2008 Introduction of HTCure™ process by Cobolt

Founding of HF Systems Engineering GmbH & Co. KG

2014

2014 Prism Award for C-WAVE and T-COGNITION™

Formation of new division HÜBNER Photonics, encompassing laser, terahertz and high frequency technology

2016

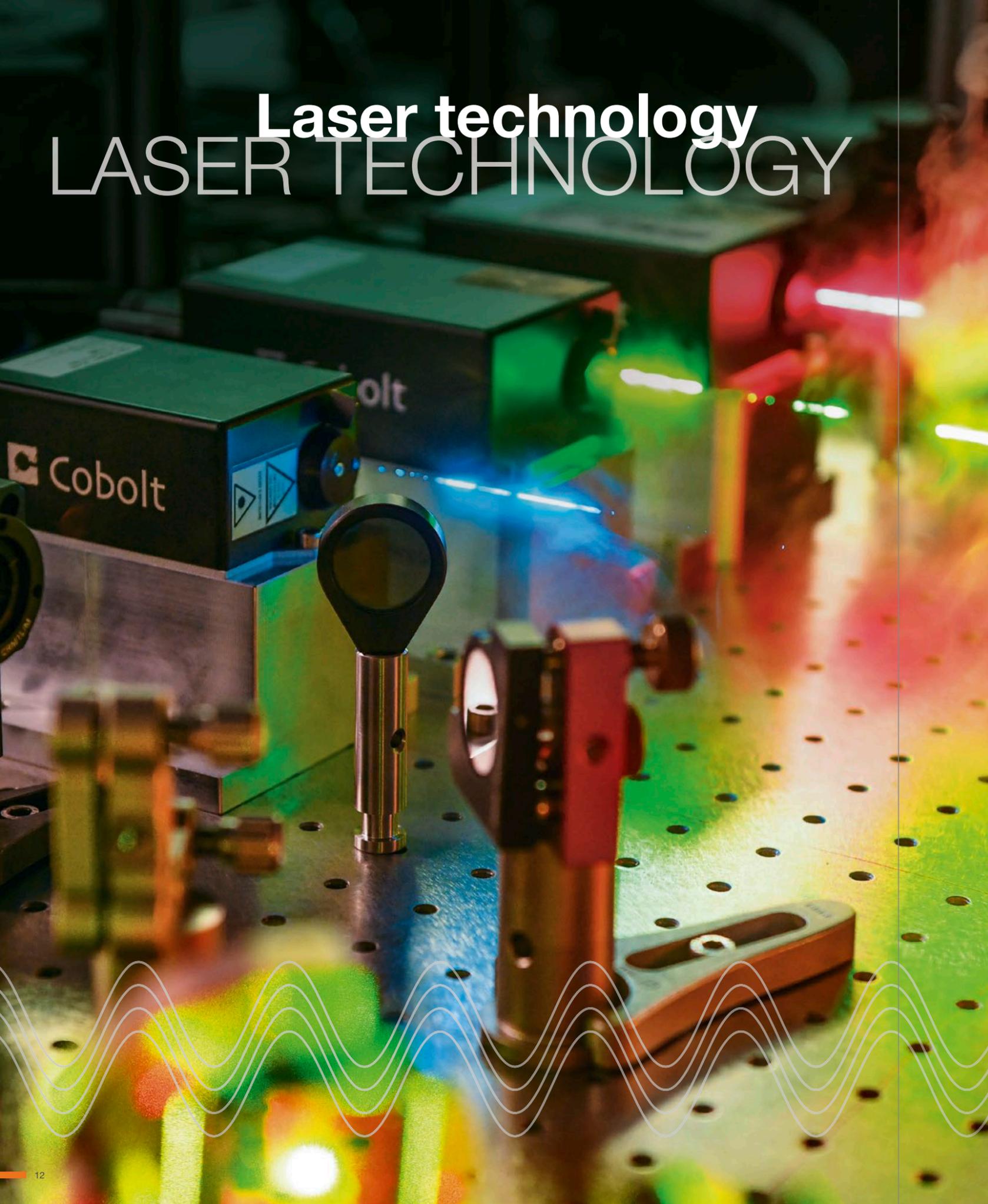
2015 Acquisition of Cobolt AB

2017 Introduction of Cobolt Skyra™ and C-FLEX

Lasers have long played a special role in Kassel, where the HÜBNER headquarters is located. For more than 40 years, green laser lines have marked the night sky of the city. Kassel's "Laserscape", created for the Documenta exhibition in 1977, is the world's first permanent laser light artwork.

Laser technology

LASER TECHNOLOGY



High performance lasers

A wide array of laser sources

Laser technology has come to have an indispensable role in scientific and medical research, in industrial production and even in many everyday applications from cosmetics to autonomous vehicles. At HÜBNER Photonics, our laser technology is offered in 3 product lines:



Cobolt – Single and multi-line lasers

Through the well-known Swedish laser manufacturer Cobolt, a proven supplier of high performance lasers of more than 15 years, HÜBNER Photonics offers one of the industry's broadest ranges of compact single-frequency CW lasers, diode lasers and Q-switched lasers across the full UV-Visible-MidIR spectrum. Using proprietary HTCure™ laser manufacturing technology, the Cobolt lasers are associated with outstanding reliability and product lifetime. The patented HTCure™ process is a technology for high precision mounting of optics that works with exceedingly high temperatures to provide outstanding durability in a highly compact design.



C-WAVE – Tunable laser

Complementing Cobolt's broad portfolio of compact lasers, the tunable lasers developed by HÜBNER Photonics cover an unusually wide spectrum and have gained a strong reputation throughout the industry. C-WAVE is one of the most unique kinds of lasers on the market – a single-frequency, CW, frequency doubled OPO (optical parametric oscillator), providing broadly tunable emission across the visible (and NIR) spectrum at the click of a button.



C-FLEX – Laser combiner

With the trend towards simplicity and user friendliness, the C-FLEX laser combiners offer the flexibility of combining any lasers from the extensive range of high performance lasers from Cobolt.



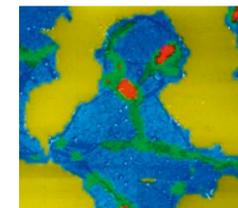
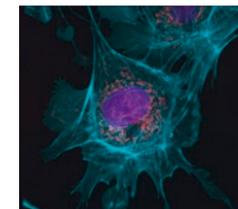
Cobolt – Single and multi-line lasers

Innovative laser solutions with high output power, stable singlemode operation and large wavelength flexibility in the UV-Visible-MidIR spectral range.

Cobolt lasers have become a preferred choice by leading instrument manufacturers and scientists in some of the most challenging applications in the fields of biomedical research, on-line quality and process control, clinical diagnosis, material research, particle analysis and semiconductor metrology. Our commitment is to increase the availability of laser-based equipment that can contribute to improving the quality of life and a better environment.

A combination of sophisticated laser designs and the HTCure™ Technology for advanced laser manufacturing allows Cobolt to provide lasers in compact formats with the performance and reliability required by the most demanding applications and for use in industrial environments.

Applications



- Fluorescence microscopy
- Super-resolution microscopy
- DNA sequencing and analysis
- Raman spectroscopy
- Flow cytometry
- Interferometry
- Semiconductor metrology
- Gas detection
- Materials processing
- Optogenetics
- Optical tweezers
- Holography
- LIBS
- LIDAR
- Dynamic light scattering

Cobolt CW and pulsed lasers

Compact single-frequency CW lasers, diode lasers and Q-switched lasers across the full UV-visible-MidIR spectrum. Using proprietary HTCure™ laser manufacturing technology, Cobolt lasers are associated with outstanding reliability and lifetime.



Cobolt 04-01 Series and 05-01 Series

Powerful single frequency CW diode pumped lasers

- 355 – 1064 nm up to 3 W
- < 0.1 % rms noise, in a perfect TEM00 beam
- < 1 MHz linewidth, superior spectral purity and wavelength stability

Cobolt Skyra™

Multi-line laser

- Up to 4 laser lines, 405 nm – 660 nm
- Permanently aligned in a single beam
- Fully integrated electronics
- Fiber coupled option

Cobolt 06-01 Series

Plug & play modulatable CW lasers

- 405 – 660 nm up to 300 mW
- Diode (MLD) and diode pumped lasers (DPL) with fully integrated electronics
- Fast and deep modulation, fiber pigtailed option

Cobolt Tor™ Series

High performance Q-switched lasers

- 355nm, 532nm, 1064nm
- <5 ns, >7 kHz free running
- Single shot to 1 kHz triggerable
- Up to 160 μJ/pulse

Cobolt 08-01 Series

Compact narrow-linewidth lasers

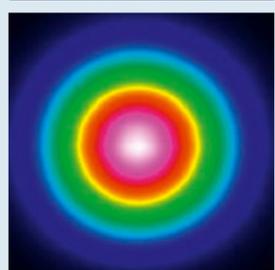
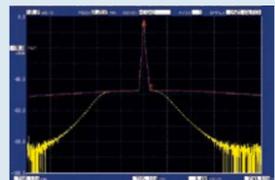
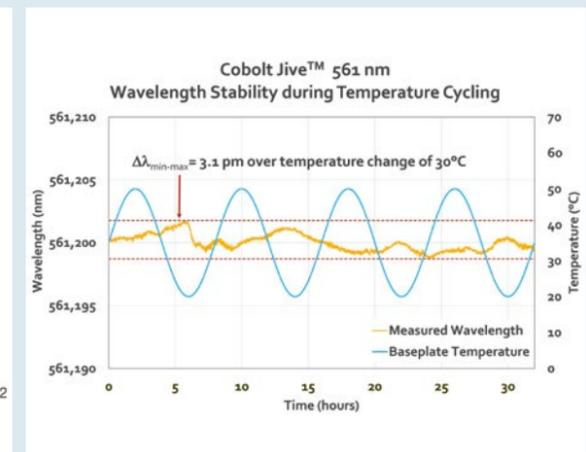
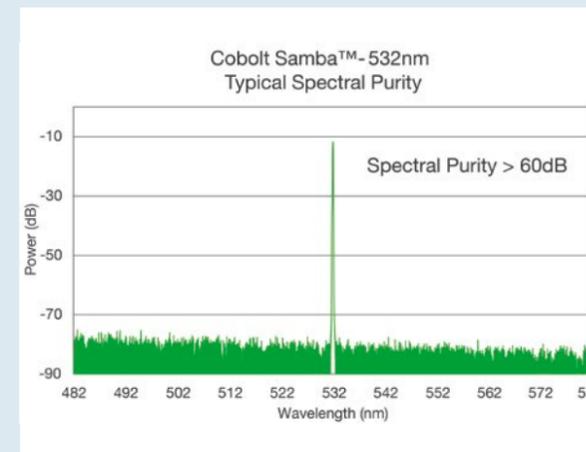
- 405 – 1064 nm up to 500 mW
- SLM diode pumped lasers (DPL) and frequency stabilized diode lasers (NLD)
- Integrated optical isolators/filters

Cobolt Odin™ Series

Compact, tunable Mid-IR OPOs

- Wavelength selectable 2-5 μm
- Tunable up to 50 nm, narrow linewidth option
- Up to 80 mW at 10 kHz

	Cobolt 04-01 / 05-01 Series	Cobolt 06-01 Series	Cobolt 08-01 Series	Cobolt Skyra™	Cobolt Odin™ Series	Cobolt Tor™ Series	max. power level
CW lasers	●	●	●	●			3000 mW
Pulsed lasers					●	●	1000 mW
Single frequency	●		●				3000 mW
Modulated lasers		●		●			300 mW
Narrow linewidth			●				500 mW
Tunable lasers					●		80 mW
Mult-line lasers				●			100 mW



Outstanding from start to finish



Pioneer with a patent

The Swedish company Cobolt arose from a research project in the year 2000. Today as part of HÜBNER Photonics, it is one of the world's leading developers and producers of high-performance lasers. The product portfolio encompasses innovative laser solutions with high output power and stable single-mode operation. In the UV-Visible-MidIR spectrum range, the products offer exceptional flexibility in wavelength adjustment.

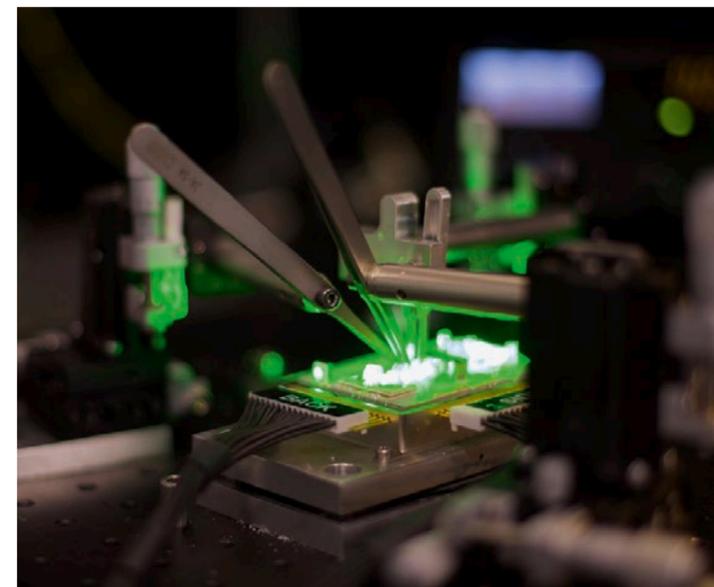
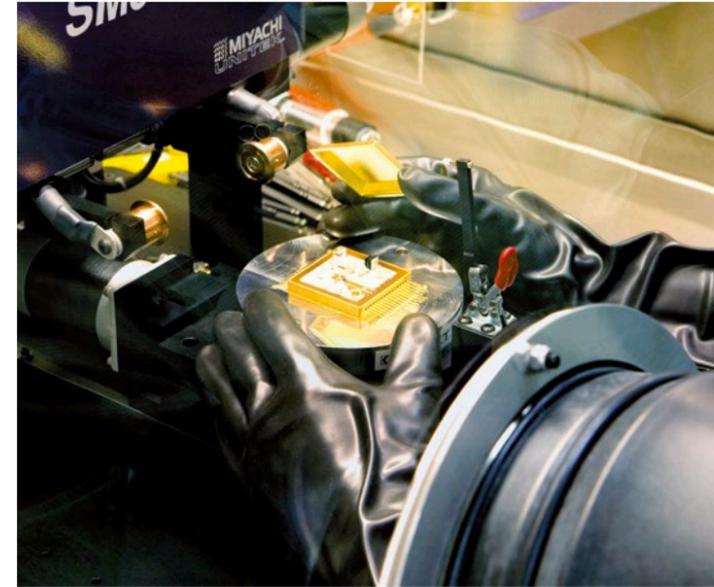
Thanks to the sophisticated cavity designs and patented HTCure™ production technology, Cobolt can produce compact lasers for a wide range of applications as well as for industrial use. Providing dependable, reliable, long-lasting laser technology for better quality of life and improved environmental protection – that's the aim of our company.

The HTCure™ process

HTCure™ is a high-temperature curing process developed by Cobolt as part of the laser production process. It allows for a very high degree of reliability in the curing process, exceptional optical performance and unparalleled stability.

In the HTCure™ process, all of the components of the assembly are selected for their thermomechanical stability and the lasers are packaged in a hermetically sealed sub-housing. As a result, during the production the complete laser unit may be heated to over 100 degrees Celsius for several hours and in various steps without losing its alignment or suffering any damage.

This thermal curing step ensures an extremely rigid and at the same time robust solution so displacements do not occur later on.



C-WAVE

The tunable laser light source

C-WAVE is the tunable laser light source for continuous-wave (cw) emission in the visible and near-infrared wavelength range. Its technology is based on optical parametric oscillation (OPO) and it is fully computer controlled. Thus, it allows you to tune from blue to red and into the near-infrared without any change of dyes or optical components. This makes C-WAVE a flexible and user-friendly laser for your applications.

Change the way you work

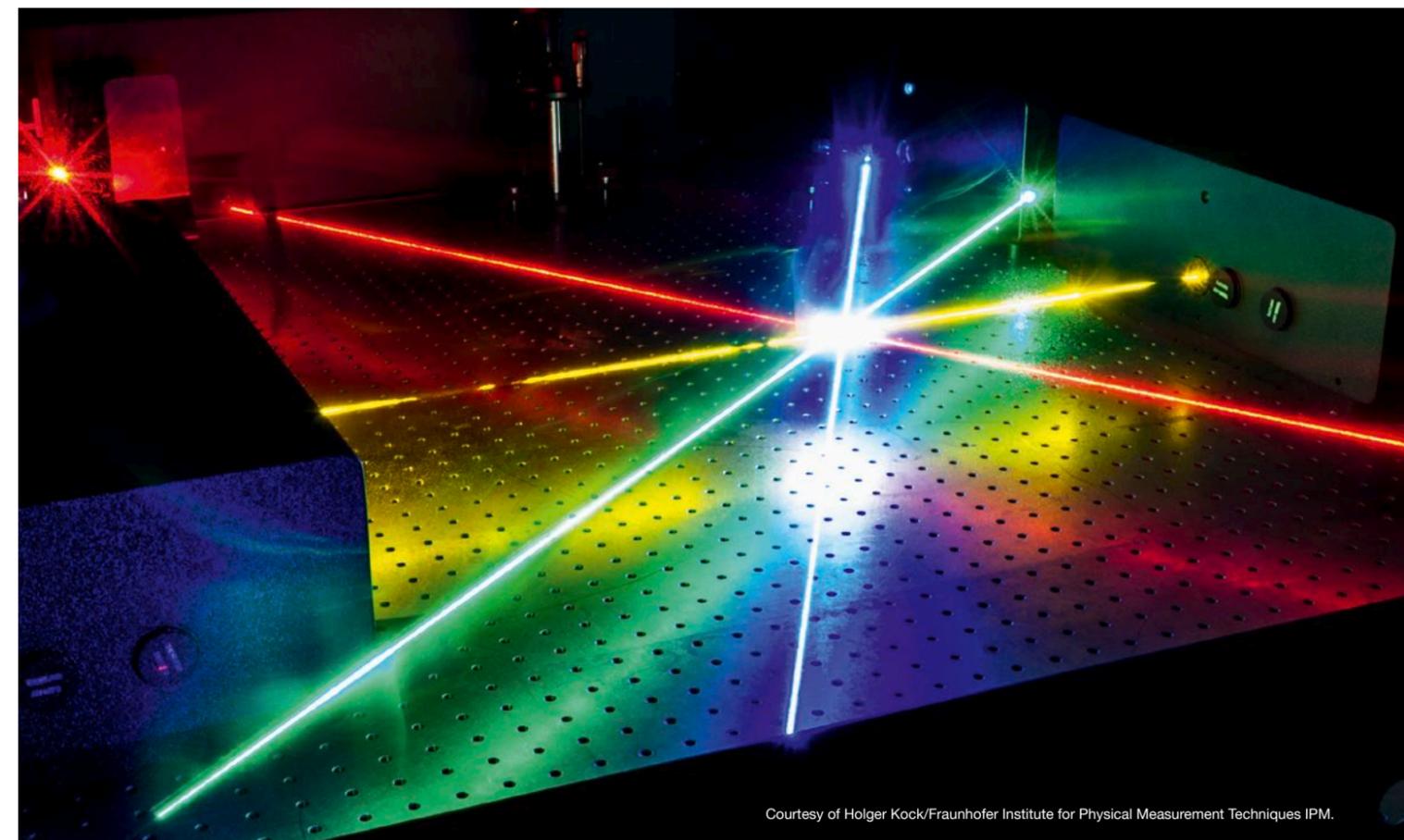
Visible, widely tunable, continuous-wave – for a long time this meant handling of toxic dyes, changing laser media or resonator mirrors and often a restricted narrow tuning range. C-WAVE is a solid state system that has no consumable components such as dyes. The wavelength can be simply set at the computer.

C-WAVE tunes itself automatically and guarantees superior beam quality as well as output stability across the whole tuning range – offering both high flexibility and precision at the same time. It provides single frequency operation, narrow spectral linewidth and options for frequency stabilization combined with an unprecedented spectral coverage.

Focus on your research, not on laser handling: C-WAVE helps you free your mind for your main tasks.

Applications

- Quantum optics
- Holography
- Nanophotonics
- Atomic physics
- Metrology
- Spectroscopy
- Biophotonics
- Photochemistry
- Interferometry



Courtesy of Holger Kock/Fraunhofer Institute for Physical Measurement Techniques IPM.

C-WAVE

Flexibility – with precision

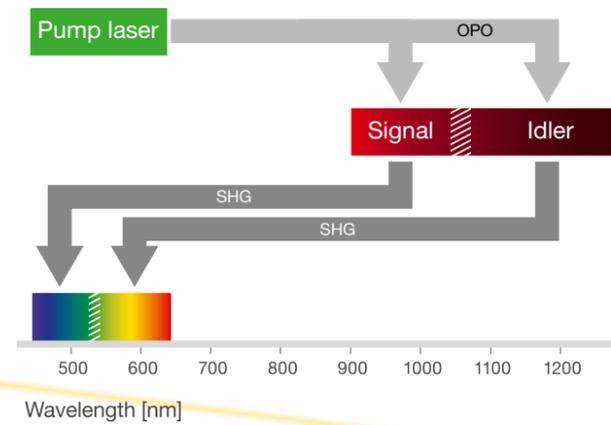


Operation principle

C-WAVE combines two nonlinear processes to achieve its outstanding spectral coverage: In the first step (OPO), a 532 nm laser pumps a nonlinear periodically poled crystal. Signal and idler photons with tunable frequencies in the near-infrared wavelength regime from 900 nm to 1300 nm are generated.

Subsequent second harmonic generation (SHG) using a frequency doubling crystal leads to conversion of the signal photons into colors from blue to green (450 – 525 nm), while the idler photons get converted into colours from green to red (540 – 650 nm).

The modular design of C-WAVE enables you to choose the color ranges that you require!



Wide tunability – choose your colors

The concept of C-WAVE allows the user to build laser-light sources for tunable continuous-wave emission from the near UV to the infrared. The bright windows in the spectral coverage chart indicate the full standard tuning range of C-WAVE. Other wavelength ranges are available upon request.

Output power – tailored to your needs

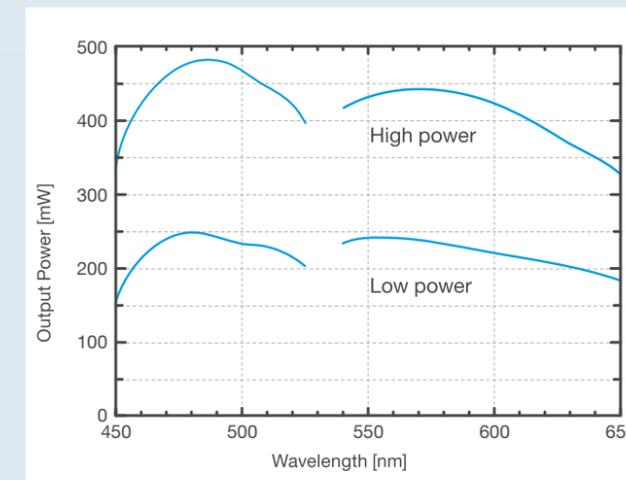
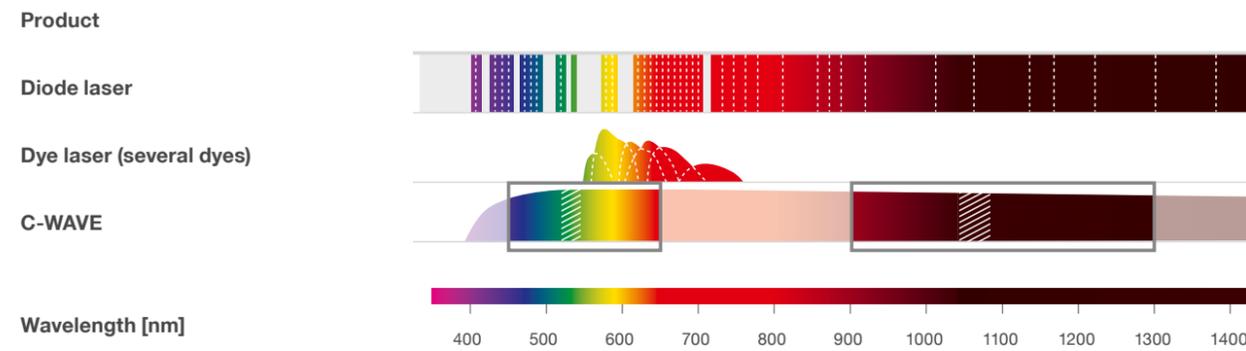
Depending on the required output power level, C-WAVE is either pumped by an external single-frequency laser or comes with an integrated laser, making operation and application even easier for you.

Wavelength options (Multiple selection possible):

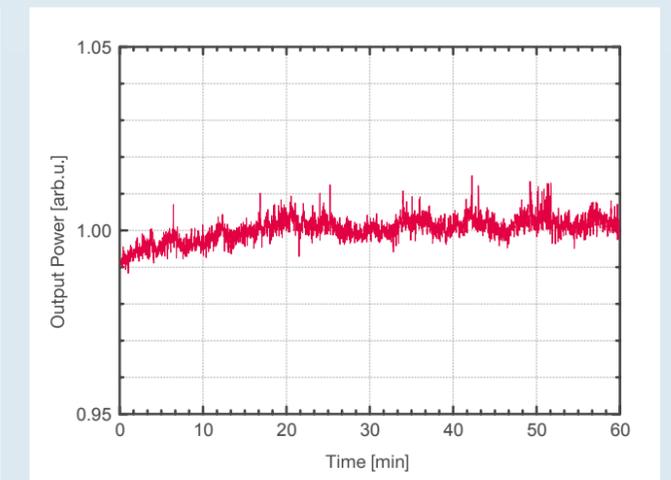
- IR (900 – 1300 nm)*
- Blue (450 – 525 nm)
- Orange (540 – 650 nm)

* gap at 1050 – 1080 nm

SPECTRAL COVERAGE – COMPARISON CHART



Typical output power over the visible wavelength range with 5 W pump laser (high power) and 1.5 W pump laser (low power).



Power stability of C-WAVE: Output power over time measured at 571 nm.

C-FLEX Laser combiners

Choose your colors

405 nm	●
445 nm	●
457 nm	●
473 nm	●
488 nm	●
491 nm	●
515 nm	●
532 nm	●
553 nm	●
561 nm	●
594 nm	●
633 nm	●
638 nm	●
647 nm	●
660 nm	●
785 nm	●
1064 nm	●

As a highly flexible and extremely compact laser combiner, C-FLEX lets you combine up to 6 wavelengths out of 17 wavelengths available. The lasers can be controlled either separately or via a common USB port. C-FLEX is field-upgradeable and ready to mount DPSS or diode lasers from either of the Cobolt 04-01, Cobolt 06-01 or Cobolt 08-01 Series. The flexible design enables integration of optional AOM modulators that allow fast modulation of DPSS lasers. Free space beam output or fiber coupling options are available. C-FLEX comprises countless options to make it your first choice in laser combiners.

The way setups are meant to be

C-FLEX features a common power supply and common interlock (key switch plus remote interlock) for all lasers. It is passively cooled and field-upgradeable. The compact and robust design of the C-FLEX provides excellent long-term stability and outstanding flexibility for your application.

Highest flexibility

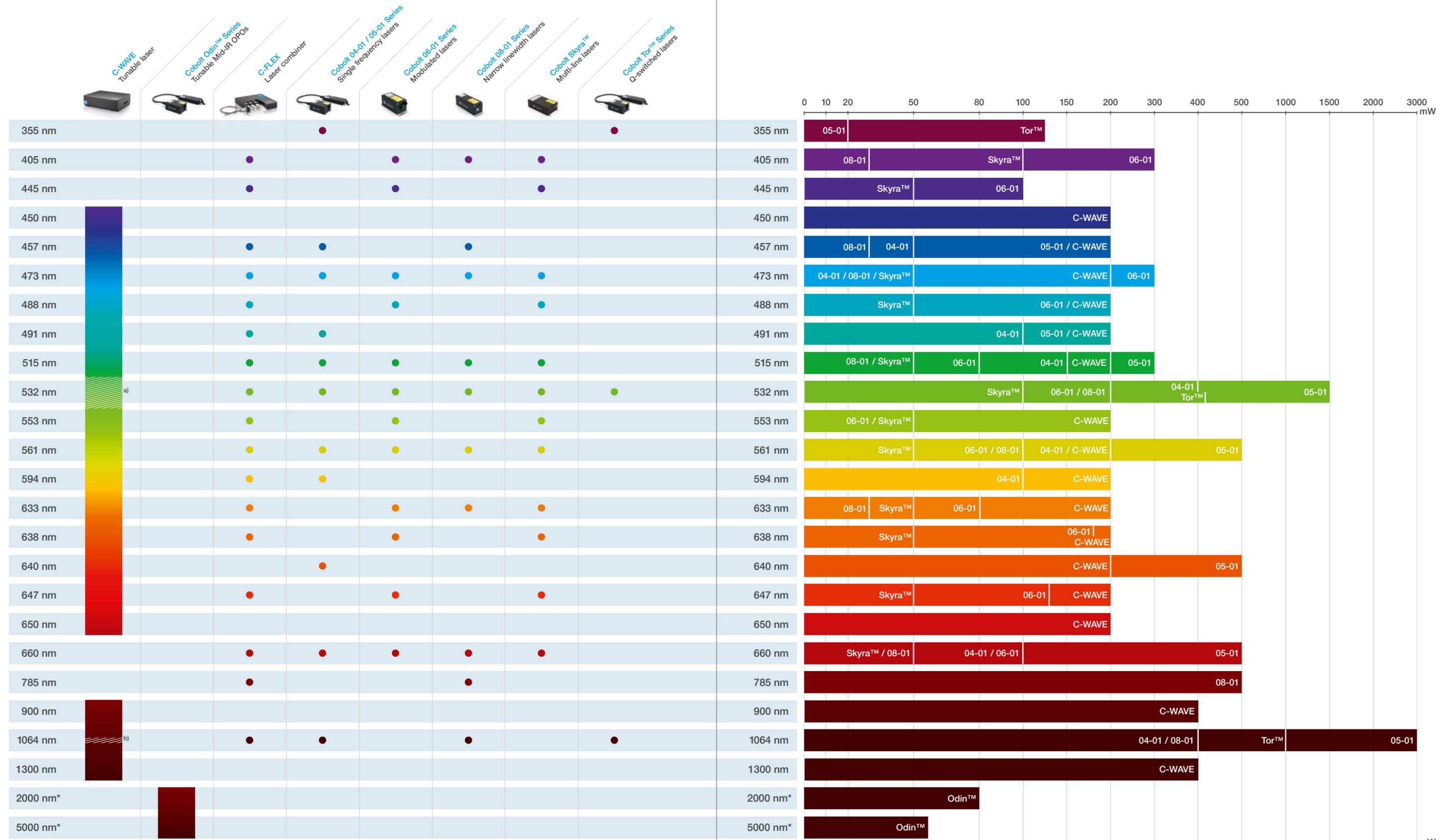
- Choose between more than 17 different wavelengths
- Combine up to 6 wavelengths for wide wavelength coverage or up to 4 wavelengths in a more compact footprint
- Control the lasers via a common USB port
- Use the analog and digital modulation capabilities of each laser via SMA connectors
- Integrate optional AOM (acousto-optical modulators) for fast modulation of DPSS lasers and power regulation
- Select optional fiber coupling (single-mode/ polarization-maintaining)

Applications

- Fluorescence microscopy
- Flow cytometry
- Raman spectroscopy
- Optogenetics
- Photochemistry
- Holography



Our laser technology products – A wide array of light sources



a) Not specified at 525 - 540 (±2) nm; range depending on selected wavelength modules.
 b) Not specified at 1050 - 1080 (±4) nm; range depending on selected wavelength modules.

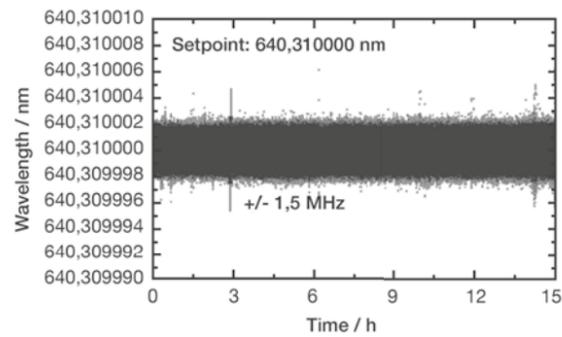
* Center wavelength selectable between 2-5um, tunable 50nm.
 ** C-WAVE typical powers may be >200 mW

Applications Lasers for Quantum Optics

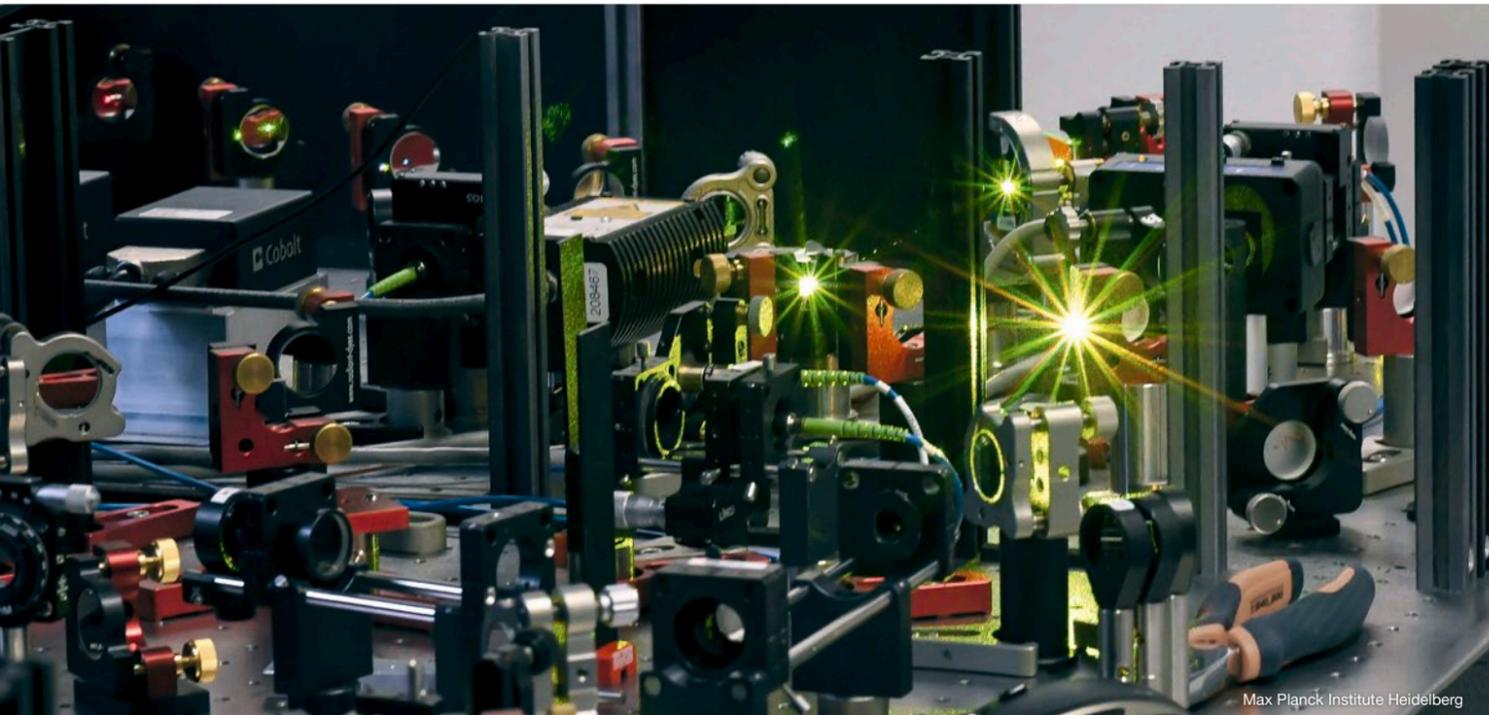
The field of quantum optics deals with the interactions of light and matter. In this still young discipline, photons or “light quanta” – the smallest particles of light – are investigated. The aim of this type of research is to gain an understanding of the overall behavior of electromagnetic waves.

The laser sources produced by HÜBNER Photonics play an important role in quantum optics research. This is especially the case with the tunable C-WAVE laser and Cobolt lasers with their high spectral purity and excellent wavelength stability. They provide exactly the flexibility and the precision that are essential for basic research applications.

- C-WAVE – Tunable laser, single frequency
- Cobolt – Modulated diode and single frequency lasers



Exemplary measurement of stabilized wavelength using AbsoluteLambda™.



Max Planck Institute Heidelberg

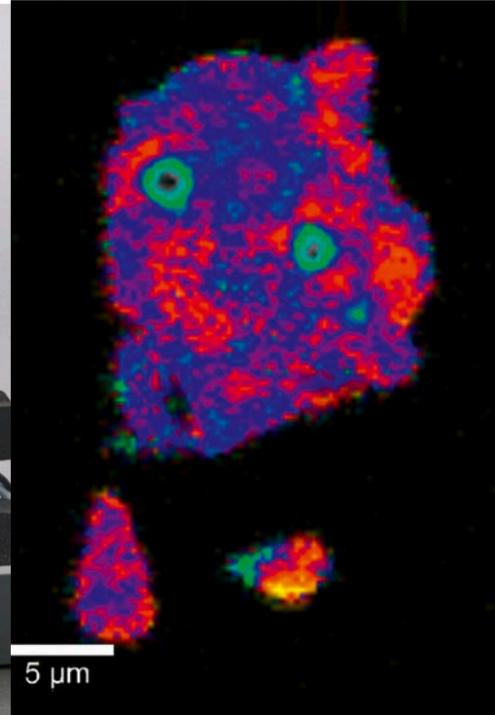
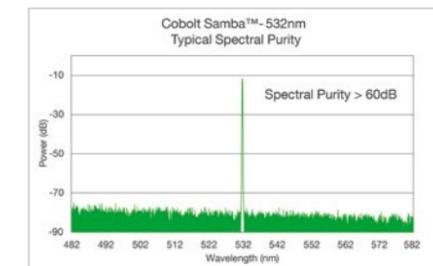
Applications Lasers for Raman Spectroscopy

The “inelastic scattering of light” was first observed and identified by C.V. Raman in 1928. In 1930, he received the Nobel Prize in Physics for this work. But only in more recent times has it become possible to make use of the so-called Raman effect by which the frequency of light changes when it is deflected by molecules. In the past two decades, Raman spectroscopy has developed as a widely applicable method of examination – for fields ranging from material analysis to life sciences applications to point-of-care diagnostics. This has been made possible through the development of compact laser sources, highly sensitive cameras and compact high-resolution spectrometers.

With the lasers from Cobolt, HÜBNER Photonics has one of the widest ranges of products on the market for Raman spectroscopy applications. The Cobolt 08-01 Series of lasers, for example, has been specially developed for Raman applications with integrated Raman filters and optional isolators. Individual lasers can be com-

bined with the C-FLEX laser combiner for added user friendliness. For applications requiring a tunable, single-frequency laser in the visible range, the C-WAVE laser is especially well suited.

- Cobolt – Single frequency and narrow linewidth lasers
- C-WAVE – Tunable laser, single frequency
- C-FLEX – Laser combiner



Applications

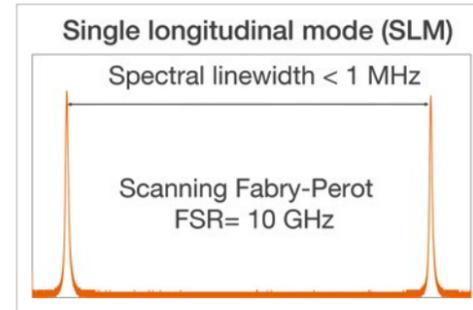
Lasers for Interferometric Applications

The term interferometry derives from the word interference. Interference is a phenomenon that occurs when two waves of any kind come together at the same time and place. Interferometry makes use of interference phenomena for measurement purposes, for example investigation of the flatness of an optical surface.

- Cobolt – Single frequency lasers
- C-FLEX – Laser combiner
- C-WAVE – Tunable laser, single frequency

Even though there are many different types of interferometric based applications, all of them basically operate on the same principle. Two beams are separated and then combined so that they interfere with each other. In order to get interference a highly coherent laser source is required. The more coherent the laser beam, or the longer the coherence length, the finer the detail that can be resolved.

HÜBNER Photonics has one of the widest ranges of single frequency lasers in the industry for interferometric techniques, including holography, Doppler velocimetry and dynamic light scattering.



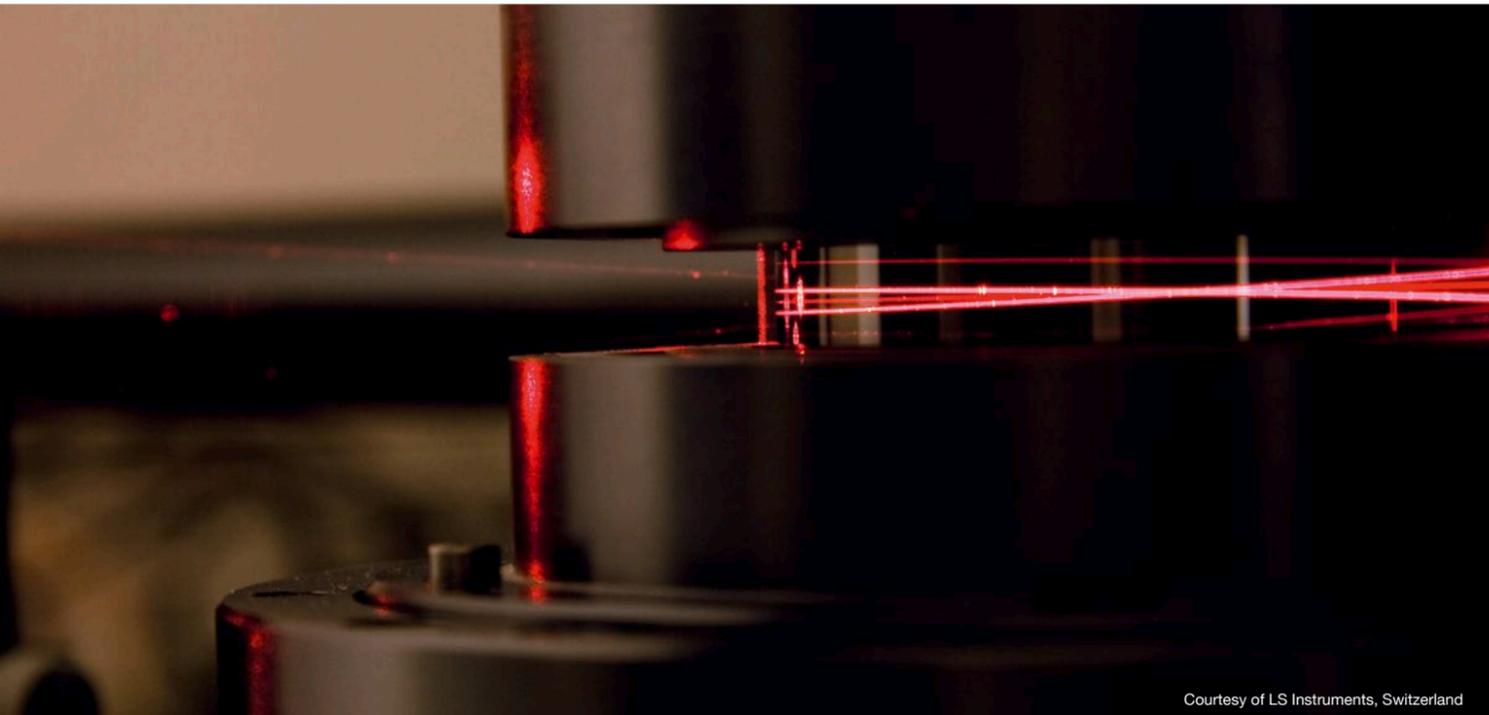
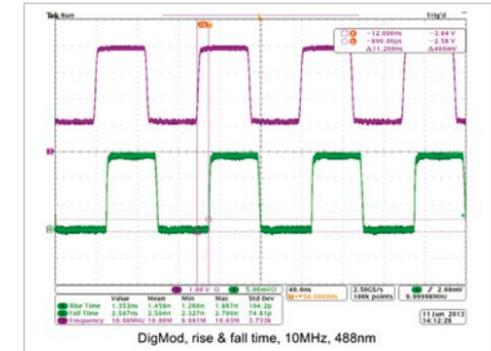
Applications

Lasers for Life Science

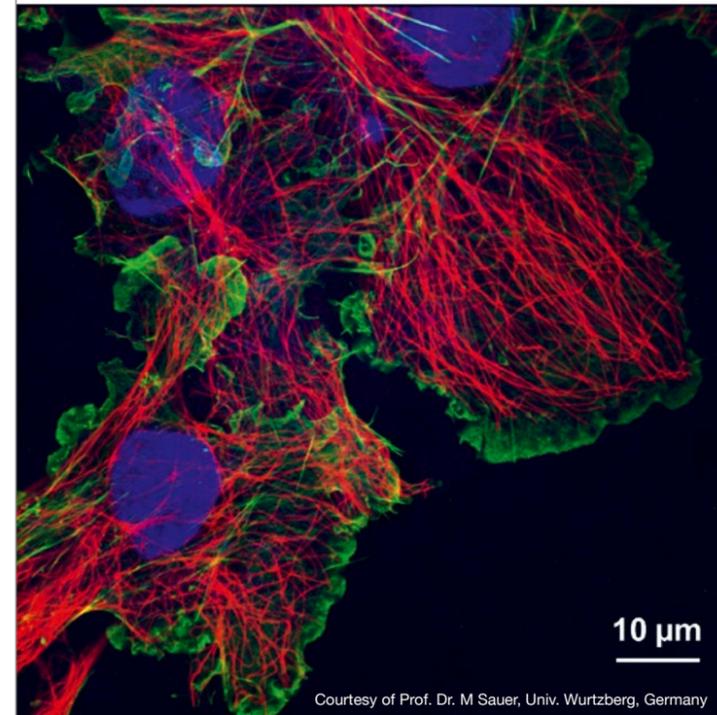
Significant applications in life science requiring CW lasers in the visible include fluorescence microscopy, flow cytometry and DNA sequencing. In all of these applications the fluorescence of specific fluorophores or biomarkers is detected, counted or imaged, leading to a deeper understanding of biochemistry.

With the lasers produced by Cobolt, HÜBNER Photonics can provide a broad portfolio of high-performance lasers for fluorescence microscopy applications. Not only do these lasers feature a standard integrated clean-up filter, at >70 dB they have one of the best modulation-extinction ratios in the industry. For greater convenience and ease of use, the individual lasers can be combined using the C-FLEX laser combiner.

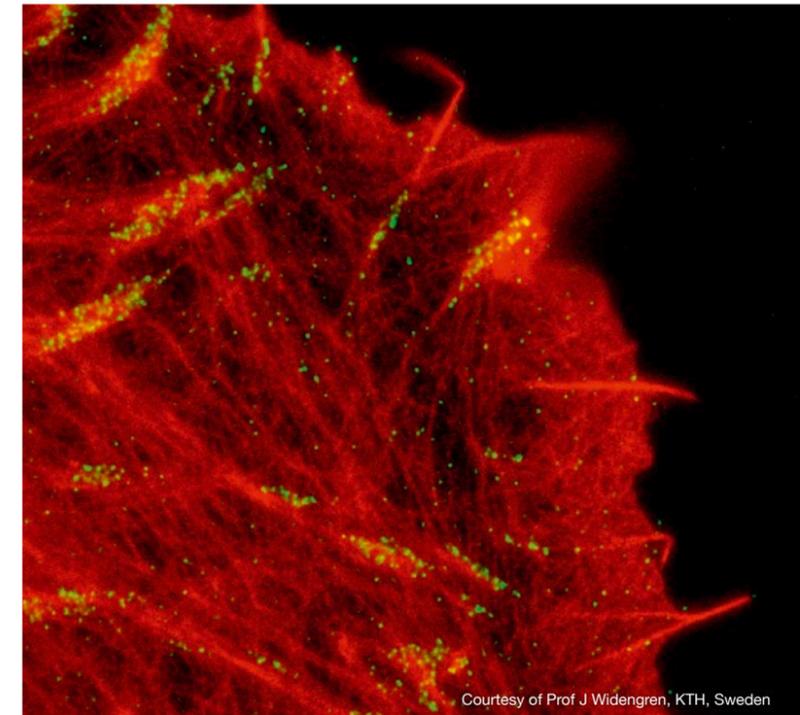
- Cobolt – Modulated lasers
- Cobolt Skyra™– Multi-line laser
- C-FLEX – Laser combiner



Courtesy of LS Instruments, Switzerland



Courtesy of Prof. Dr. M Sauer, Univ. Wurtzburg, Germany



Courtesy of Prof J Widengren, KTH, Sweden

TERAHERTZ TECHNOLOGY

Terahertz technology

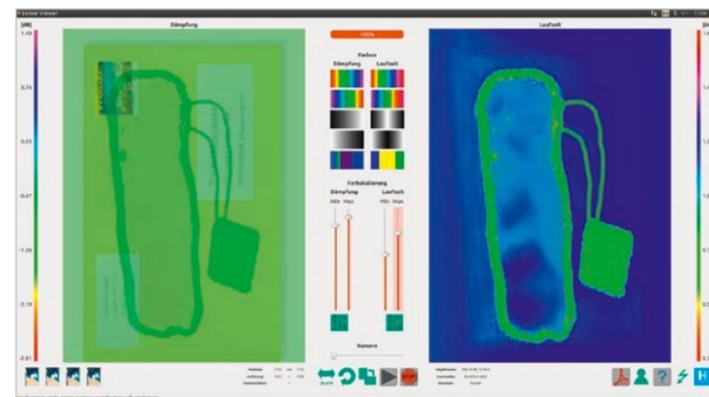
Visualizing the invisible

Terahertz (THz) waves penetrate paper, clothing, plastics and many other materials without causing any damage – contact-free and in seconds. This makes THz technology a unique tool for the detection, analysis and hyperspectral imaging of materials. On the basis of the latest research, HÜBNER Photonics is developing highly compact systems for various applications, ranging from mail inspection to industrial quality control. With their plug-and-play features and intuitive user interfaces, HÜBNER Photonics products also deliver outstanding ease of operation. Due to its non-invasive and non-ionizing properties, THz waves are completely harmless for human tissue. Thus, no expensive safety precautions are required for operation.

With the THz imager T-SENSE, small packages and letters can be scanned and hidden contents can be visualized. This makes it possible to detect dangerous materials such as drugs or explosives before opening the mail.

The Prism Award winning THz spectrometer T-COGNITION has been developed in cooperation with the Fraunhofer Institute for Physical Measurement Technique (IPM) and is an advanced system for the automated identification of hidden drugs or explosives inside letters or small parcels within seconds on the basis of their characteristic spectroscopic fingerprints. The systems help to improve security in mailrooms, at customs stations or at official offices – without any health risk for the users.

The T-SPECTRALYZER product family comprises turn-key THz spectrometers for scientific research as well as industrial non-destructive testing (NDT) applications. The variety of available options provides highest flexibility to make the T-SPECTRALYZER fit to the customers' individual applications.

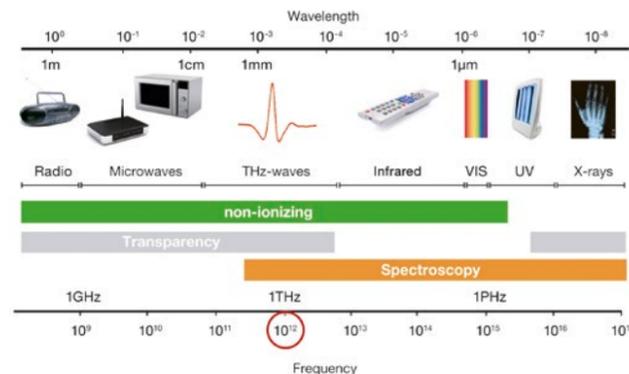


T-SENSE user interface with different filters side by side. All parameters are intuitively customizable.



THz waves – Combining characteristics

THz waves are a part of the electromagnetic spectrum in the frequency range of 0.1 THz to 10 THz. Many non-conductive materials such as plastics or PVC, ceramics, paper or clothing are nearly transparent in the THz frequency range, a characteristic feature known from GHz waves. At the same time, THz waves are absorbed at varying degrees by substances such as drugs, explosives and many other materials, providing spectroscopic information about the sample material, similar to a spectrum produced using optical wavelengths. These absorption characteristics can be used to produce a sort of spectroscopic fingerprint, making it possible to identify various substances, even when they are concealed in a letter or parcel, for example.



Applications

Public security

- Mail inspection by hyperspectral imaging for detection of hazardous goods
- Identification of drugs and explosives using Time-Domain-Spectroscopy (TDS)

Non-destructive testing (NDT)

- Detection of defects and cavities in components (hyperspectral imaging)
- Identification of substances through plastic pipes or tubing and other types of packaging using Time-Domain-Spectroscopy (TDS)
- Determination of the thickness of layers of multi-layered systems for identification purposes
- Analysis of substances in powder and tablet form
- Analysis of gases
- Investigation of moisture distribution
- Distinction between crystal and amorphous structures



T-SENSE

The THz imager for safe and secure mail inspection

Mailrooms in companies and in public agencies are particularly vulnerable to attacks via postal deliveries. Often the personnel at these facilities are not protected against the dangers of such attacks. To reduce these risks, HÜBNER Photonics has developed an innovative table-top device for the inspection of letters and small packages. The THz imager T-SENSE visualizes objects and hazardous substances that may be concealed in postal items.

Unlike x-rays, there is no health risk with the THz imager T-SENSE. Typical safety precautions for conventional imaging devices are not needed. And thanks to its intuitive graphic user interface, the systems are very simple to operate. T-SENSE facilitates effective and safe postal inspection, helping to keep people safe and secure.



T-COGNITION

Identifying hazardous substances

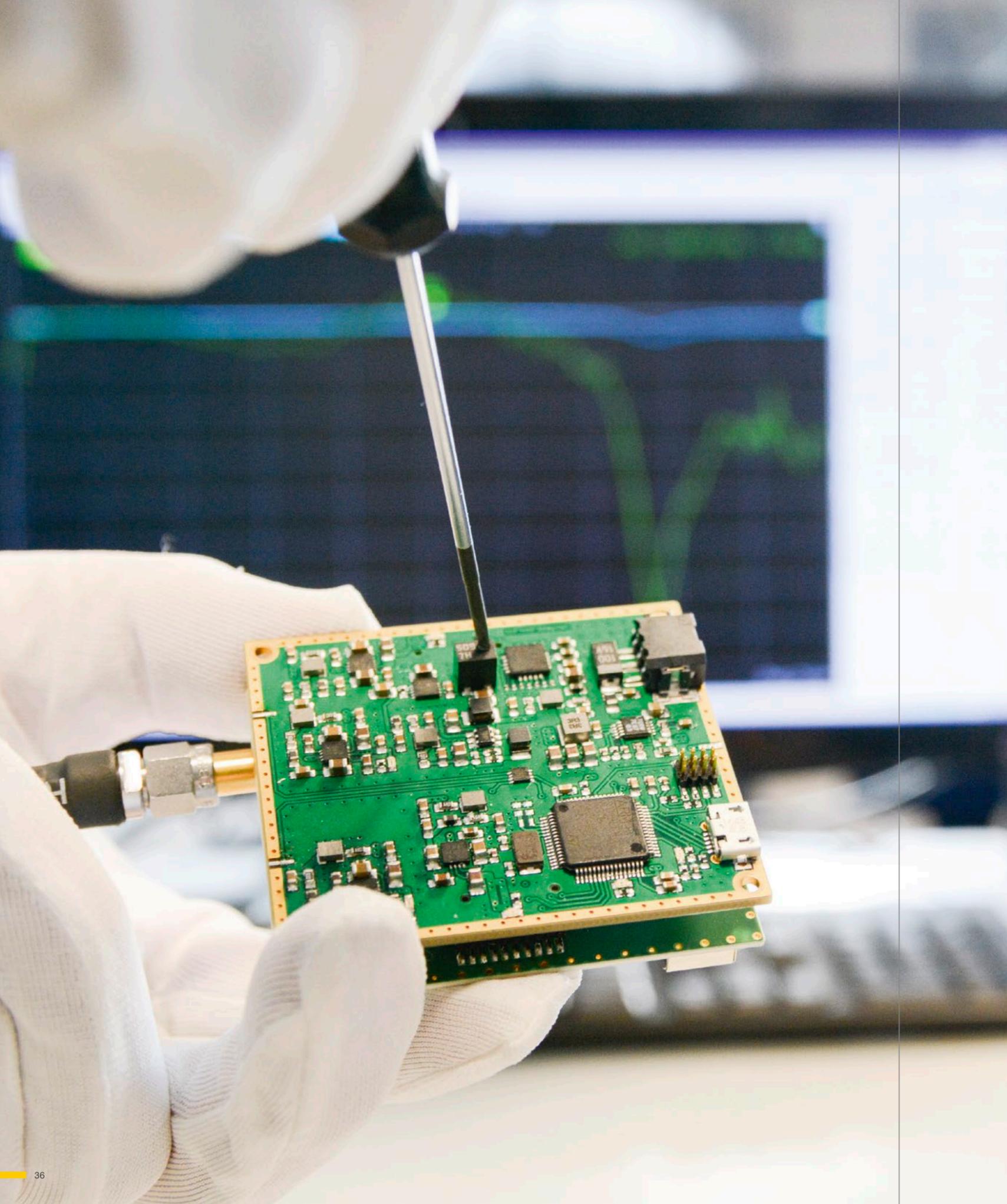
The THz spectrometer T-COGNITION is an extremely effective security technology. With reliability and precision, it identifies hidden drugs and explosives in letters and small packages without the necessity of handling or opening the item in question. Within seconds, T-COGNITION identifies the spectroscopic fingerprint of the hazardous substance or material by comparing the data with its own database. This system enhances work safety in prisons, at custom controls, at authorities, in companies and embassies, to name but a few.

T-SPECTRALYZER

The all-round spectrometer

The T-SPECTRALYZER products have been developed for quick use applications and for routine measurements in daily analytical work. The product family comprises turn-key systems operating either in transmission or reflection geometry or both simultaneously as well as fiber-coupled solutions, which provide full flexibility to adapt the spectrometer to the customer's application. The systems only require a normal mains connection and are ready for use without any additional infrastructure. Thanks to the most modern technology, the THz spectrometers function without any additional cooling or external gas supply. This allows for quiet and very economical operation. Individual add-on modules and the intuitive user interface support the recording, processing and export of measurement results. Not least, the automatic user-configurable report functionality makes T-SPECTRALYZER the most user-friendly THz spectrometer.





HIGH FREQUENCY High frequency technology TECHNOLOGY

A pathway for innovative technology

For decades, high frequency technology has been enabling applications that influence – and even help to manage – our daily lives on a global basis: Navigation, telecommunications, weather forecasts and early warning systems all depend on HF technology. HÜBNER Photonics is participating actively in the ongoing development of this leading edge technology to enable progress in its use for everyday applications as well as for industrial processes.

Together with customers, HÜBNER Photonics develops and manufactures customized high-precision components and systems – from oscillators, amplifiers or filters to complete transmitting and receiving systems. Throughout the industry, HÜBNER Photonics products are known for their very high measurement stability and exactitude, and are distinguished by their very large performance spectrum.

In addition to enabling precise distance measurements, HÜBNER Photonics's broadband radar technology also facilitates contact-free monitoring of automated production processes – dust, rain or darkness pose no obstacle for radar frequencies making it a true non-destructive analysis technique. Radar also offers eyes to autonomous vehicles, assessing the surroundings for unusual objects or threats. Chances are radar technology is already helping you today in your daily life.

The whole spectrum of high frequency technology

HF Systems Engineering (HFSE) operates as a dynamic start-up unit within the HÜBNER Group. HFSE is specialized in the development and production of highly precise components for high frequency and radar technology as well as complete transmit and receive systems including data analysis.

High frequency components

From antennas through waveguides and connectors to circuit boards: HFSE not only produces standard components but also special parts according to individual customer requirements. HFSE handles complete new developments, enhancements or repairs – to customers requirements.

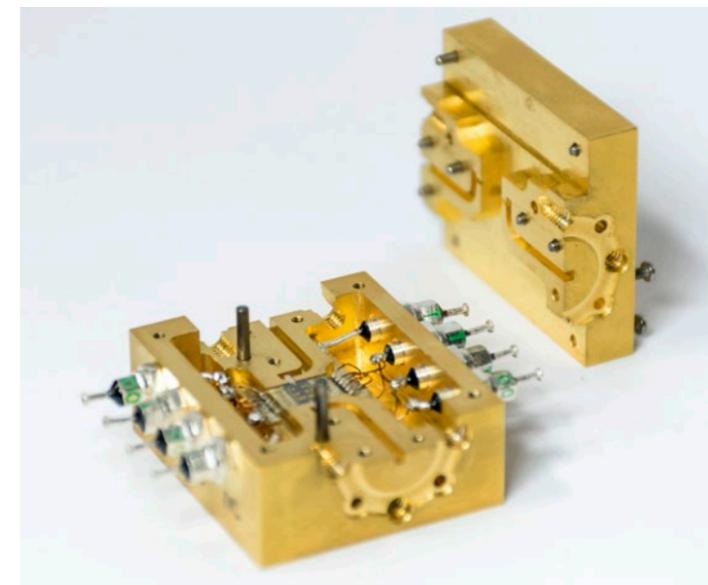
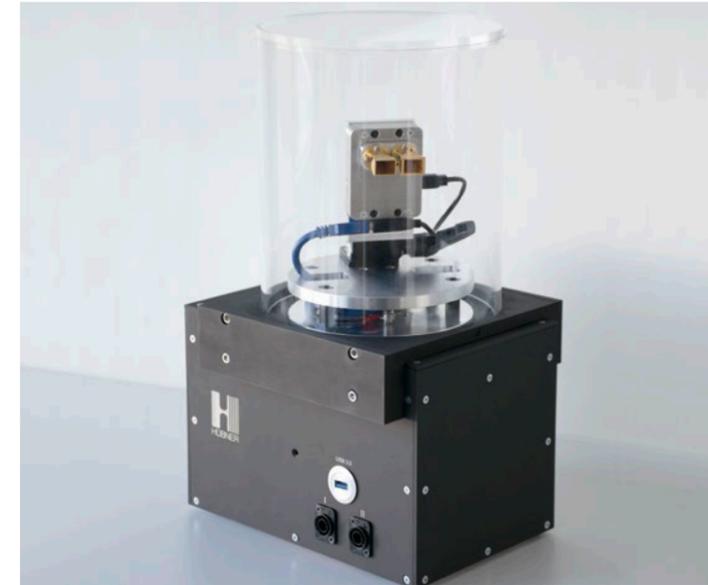
- Frequency multipliers
- Filters
- Amplifiers
- Waveguides
- Couplers
- Antennas
- Calibration kits for vector network analyzers
- Frequency generators/modulators
- Mixers
- Passive radio meters
- Cryogenic components/systems

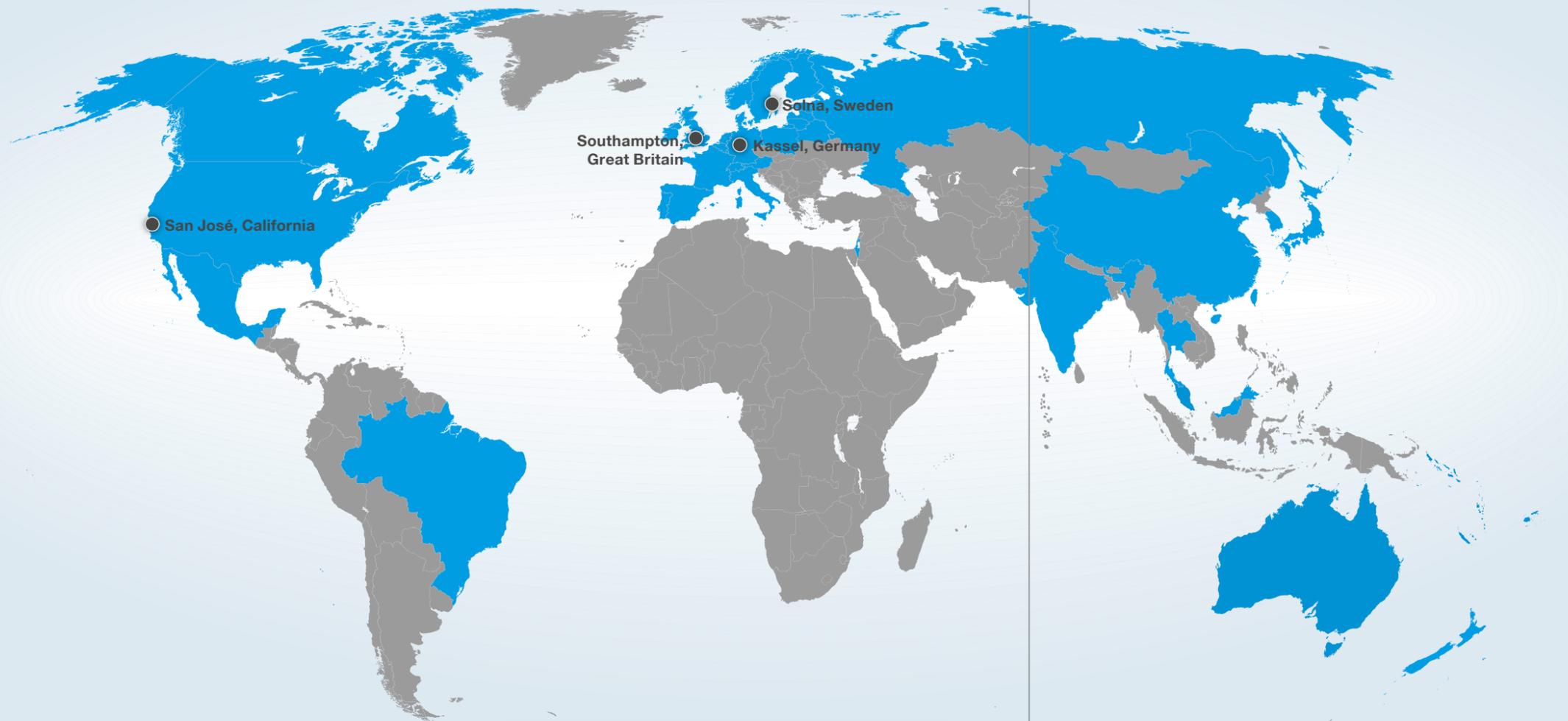
System technology

The signal sources produced by HFSE provide the outgoing signal for transmit-receive modules in both free-running or PLL-stabilized oscillators. The systems are augmented by amplifiers – power amplifiers (PA) on the transmission side as well as low-noise amplifiers (LNA) on the reception side. Analog-digital converters (ADC) with very high bit depth and connected with FPGA-based FFT facilitate fast data processing and analysis.

HFSE uses its detailed system know-how to develop integrated customer-specific systems for particular applications. This also involves the analysis of the produced data and data presentation via a graphic user interface.

- Radar transceivers
- Multistatic fully polarimetric wideband radar transceivers
- Transmit/receive systems
- Frequency generators/modulators





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