



Gigahertz-Optik

Member of the BERGHOF GROUP

NO MATTER WHAT LIGHT... we measure it.

Gigahertz-Optik – Your partner in Photometry, Radiometry
and Spectroradiometry from UV to IR for more than 35 years.

Development
Production
Quality

MADE in GERMANY

Innovations in Optical Measurement Technology
Quality Made in Germany

Innovative Optical Radiation Measurement Solutions

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Gigahertz Optik GmbH

Highest standards in Light Measurement Solutions since over 35 Years

Gigahertz Optik GmbH was founded in 1986 as an independent company in the Munich area / in Germany.

The continuous development of its product range has resulted in a comprehensive selection of light measurement devices, finely tuned accessory products, and services.

With its US subsidiary, Gigahertz-Optik Inc., Gigahertz Optik GmbH is a global manufacturer of metrological solutions for optical radiation.

Since January 1, 2020, Gigahertz Optik GmbH is part of the Berghof Group GmbH further enhancing our capabilities and long term strategies.

Our Life is Light



Introduction

Products & Solutions

- for Industry
- for Research and Development
- for Radiometric & Photometric Applications
- for Quality Assurance

Light Measurement Technology Directly from the Manufacturer

Gigahertz Optik GmbH provides more than thirty five years of experience in the development, production, calibration and distribution of optical radiation measurement equipment. We are globally recognized experts in the entire optical spectral range from ultraviolet (UV) to infrared (IR).

As a medium-sized manufacturer, we offer a high level of flexibility and respond to the needs of our customers and markets. We always try to help our customers in being successful. Our company has earned worldwide recognition through the individual and intensive support of our customers in many areas of research and industry. We are also part of the Berghof Group, which offers us very good framework conditions and allows long-term planning

Innovative Technology for Challenging Applications

With a wide range of products from detectors, spectroradiometers, homogeneous light sources to entire measurement systems paired with a large selection of accessory components such as calibration standards, we can fulfill just about any application in optical radiation metrology. We also specialize in custom solutions which further broadens our scope.

Our fields of application are diverse including but not limited to measurement solutions for UV radiation, SSL characterization, measurement of general and special lighting, assessment of optical radiation risk, measurement of solar radiation and photomedicine, characterization of image sensors or the optical determination of material properties.

Metrological Solutions for...



LED / SSL Products

Binning or sorting LEDs with respect to intensity and/or color is a high priority in LED manufacturing and production processes.

Gigahertz-Optik's BTS series spectral light and color measurement instrumentation is especially designed for this task.

The BTS line includes portable handheld meters, fully automated testing systems and instruments designed for integration into existing production setups.



Picture: ThisIsEngineering / Pexels

Optoelectronic Sensors

Optoelectronic sensors are used for contactless registration, distance measurement and monitoring, identification, area security and data transfer. LiDAR is a key driver these days. LEDs and laser diodes like VCSELs are used as sources whereas phototransistors and photodiodes are used as detectors in the UV-VIS-NIR spectral range.

Gigahertz-Optik provides measurement instrumentation for CW and time resolved intensity measurements (ns range) as well as for spatial radiation and receiving characteristics.



Picture: ThisIsEngineering / Pexels

Luminaires & Task Lighting

Manufacturers of luminaires and task lighting require a measurement technology tailored to the specifics of how and why the light sources are to be employed.

Gigahertz Optik GmbH produces devices for many different light measurement quantities including intensity, actinic effect, spectrum, light color, temporal switch-on behavior, flicker, long-term stability as well as UV and blue light hazard.



Picture: Tim Guow / Pexels

Transmission, Glaze, Haze, Filters, etc.

Light transmission is the visually perceived light transmittance of transparent materials.

Transmission is an important specification for glass used in vehicles, displays, films and glazings whose transmittance is evaluated based on the photometric sensitivity ($V(\lambda)$) of the human eye.

Gigahertz Optik GmbH produces instrumentation including transportable handheld devices including integrating spheres for light transmission and haze measurement.



Picture: Junior Teixeira / Pexels



General Lighting

LED luminaires are replacing traditional lamps in general lighting applications. The particular emission spectra of a typical LED requires more advanced light meter technology.

Previously, illuminance was the main measurement criteria, but now **color temperature, color rendering index and flicker** are now also essential when evaluating illumination systems.

Gigahertz-Optik's BTS and MSC series high-quality light meters provide all the required features and functions for accurate LED illumination qualification.



Picture: Anete Lusina / Pexels

Photomedicine, Phototherapy and UVC Disinfection

UV and blue light, LEDs, laser diodes as well as low intensity gas and solid-state lasers are used in phototherapy and photomedicine.

Gigahertz Optik GmbH offers measurement devices for:

- UV-A, UV-B and UV-C irradiance
- UV-B 311 nm and excimer laser 308 nm irradiance for re-pigmentation in vitiligo
- Bilirubin irradiance
- 220 nm to 230 nm LED, 254 nm Hg or 222 nm KrCL Excimer deep UV-C for disinfection



Picture: iStock

Photochemistry and UV Curing

High energy short wave lamps and LEDs produce sufficient irradiance levels to initiate and accelerate photochemical reactions and polymerization in photocurable materials.

Gigahertz-Optik's RCH series UV and blue light radiation detectors are capable of measuring gas discharge and LED lamps with an optical radiation density of up to 40W/cm² within hot environments.

Spectroradiometers such as the BTS256-UV for conveyor belt applications are also available for e.g. QA purposes.



Picture: Gigahertz Optik GmbH

UV, Blue and Infrared Hazard

Ultraviolet radiation and intensive blue light or infrared are hazardous to the skin and eyes. Accurately determining the UV content in sunlight and artificial light requires instruments designed with the highest possible differentiation between short and long wave responsivity.

Besides manufacturing measurement instruments and personal dosimeters for ACGIH / ICNIRP and CIE Erythral Effective Irradiance, Gigahertz Optik GmbH is a long term partner of the Thematic Network for UV Measurements whose main goal is to determine and report key UV statistics worldwide.



Picture: Gigahertz Optik GmbH



Measurement of LED Grow Lights used in Horticulture (PAR)

LED lighting offers horticulturalists many potential benefits such as increased crop yields, improved product quality, and control of particular plant characteristics as well as the normal solid-state lighting benefits of reduced energy and maintenance costs. LED lighting can supplement natural sunlight within greenhouses to extend fruit, vegetable and flower growing seasons, particularly during the shorter days of winter. To control the exposure or even tune the spectral shape is the measurement task in this application which we can make possible.



Picture: Gigahertz Optik GmbH

Solar Radiation Measurements

Ground level solar irradiance is dependent on various atmospheric parameters such as cloud cover, total ozone and aerosol content. Most of the atmosphere's ozone is contained in the stratosphere, providing essential protection from the Sun's harmful UV radiation. Ground-based spectroradiometer measurements of direct solar UV irradiance can be used to determine the Total Ozone Column, TOC. This requires a spectroradiometer capable of tracking the solar zenith angle and measuring spectral irradiance within a narrow field of view and superb



Picture: Gigahertz Optik GmbH

interal stray light correction. We offer as well UV Index or AOD measurement systems.

Laser Power Measurement

Lasers are used in optical communications, laser printing, material processing, distance measurement (LiDAR), medicine and mass spectrometry etc.. The power (peak power, average power, pulse shape) or energy as well as the stability of the laser being used must be measured in order to control for instance the safety according to safety standards like Artificial Optical Radiation Directive 2006/25/EC or laser classification according to EN 60825-1 classification. We offer a comprehensive product range with high-accuracy current amplifier/display units with peak and energy evaluations and intuitive operation, integrating sphere or large photodiode detectors. This all combined with ISO 17025 calibrations.



Picture: iStock

UVC Radiation

Short wavelength high energy ultraviolet radiation in the UV-C spectral range from 100 nm to 280 nm is widely used in the germicidal and bactericidal disinfection of air, surfaces and water. UVC radiation is lethal to airborne pathogens that can cause diseases like tuberculosis. The COVID-19 pandemic has sparked a marked increase in demand for germicidal UV sources and the need for accurate measurements with suitable UVC light meters. In order to maintain Ultraviolet Germicidal Irradiance (UVGI) efficacy while ensuring safety from overexposure to UV radiation, measurements of the germicidal sources and areas of application are performed.



Picture: Gigahertz Optik GmbH

Due to its high and pre-dominantly monochromatic output at 253.7nm, low pressure mercury has historically been the light source of choice in UV-C germicidal applications. Medium and high pressure mercury

sources are also in use as well as pulsed Xenon. New developments in germicidal UV sources of particular note are UV-C LED arrays (265-280)nm and far UV lamps such as excimer KrCl (222nm).



Spectrophotometer

Measurement system for determining the spectral absorption coefficient and effective scattering coefficient of scattering media. Different stages of expansion in the spectral range UV, VIS to IR. For clear samples the classical 8°/d measurement geometry can be applied.



Picture: Gigahertz Optik GmbH

Modular Integrating Sphere Design

Integrating spheres capture, internally integrate and evenly diffuse light input independent of angle and spectra. This makes them useful optical radiation measurement tools for total power measurements.

Gigahertz Optik GmbH's UM series modular system integrating spheres allow user customization of size, coating, aperture geometry and any supporting components like frames, adapters, lamps, detectors and others.



Picture: Gigahertz Optik GmbH

Optical Properties of Materials

Light transmission, reflection and absorption are important parameters when qualifying the optical properties of materials. Gigahertz Optik's ART and ARTA series integrating spheres are tailored to the specifics of scattered optical radiation measurement.

Our product range also includes self-contained spectral transmission measurement devices for in-situ use within the visible spectral range.



Picture: Dobromir Hristov / Pexels & Gigahertz Optik GmbH

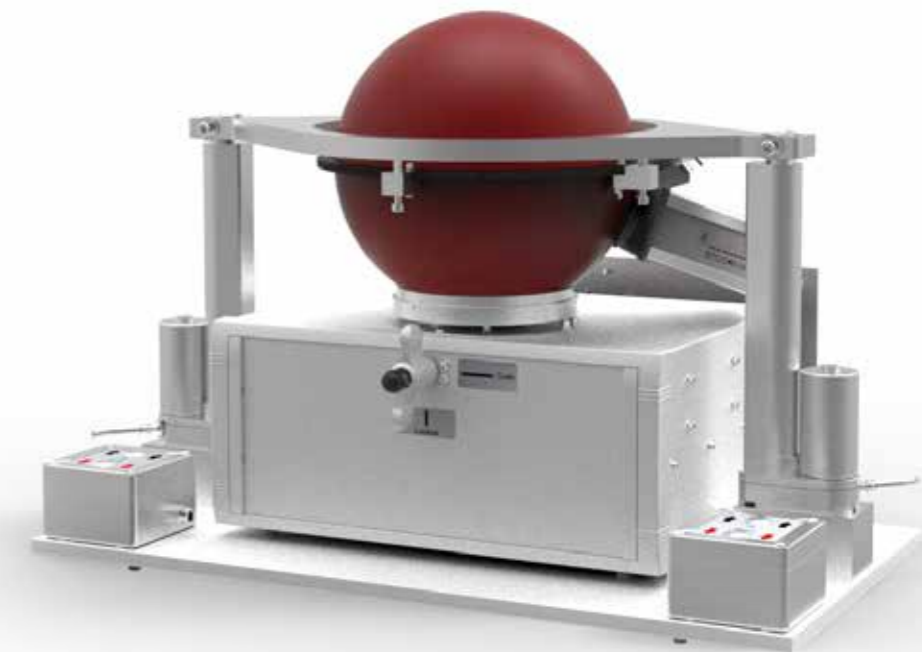
Optically Diffuse Materials

Optically diffuse reflective materials are used in two and three-dimensional designs. Typical applications of the 2D design include reflection standards and projection surfaces. 3D designs include integrating spheres, laser pump chambers and other optical radiation integrators.

Gigahertz-Optik offers barium sulfate, white and grey synthetic optical diffuse material provided as raw stock, semifinished and optical grade finish plus custom machined parts to customer design.



Picture: Gigahertz Optik GmbH



LED/SSL Measurement and Test Instruments

The special features of LEDs like long life and low power consumption can only be realized if the LEDs are operated below the specified maximum junction temperature.

This must be taken into account in the assessment of compliance with photometric and colorimetric specifications. Gigahertz Optik GmbH offers numerous **quality assurance instruments** ranging from **handheld meters** to an **LED test bench with thermoelectrically controllable measurement test sockets**.

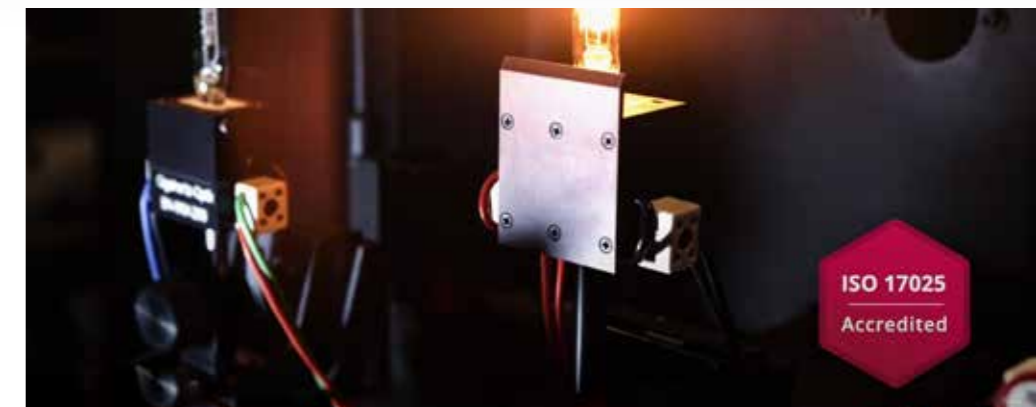


Picture: Gigahertz Optik GmbH

Calibration Standards

Calibration entails determining the deviation of a measurement device from the nominal value of a calibration standard. Gigahertz Optik GmbH offers **calibration lamps** and **detectors** for various optical radiation parameters.

Our calibration laboratory is **accredited by ISO/IEC/EN 17025** (registration no. D-K-15047-01-00 by DAkkS) for the **spectral irradiance** and **spectral responsivity**.



Picture: Gigahertz Optik GmbH

Uniform Light Sources

Luminous fields with the highest possible **luminance homogeneity** levels are used for **pixel adjustment** of **image sensors** and **camera systems**.

The same intensity is applied on every pixel positioned in the exposure plane. Deviations in pixel signals can then be adjusted.

Gigahertz-Optik GmbH manufactures its **uniform light sources** using **integrating spheres**, **lamps** and **monitor detectors** from its own stock parts.



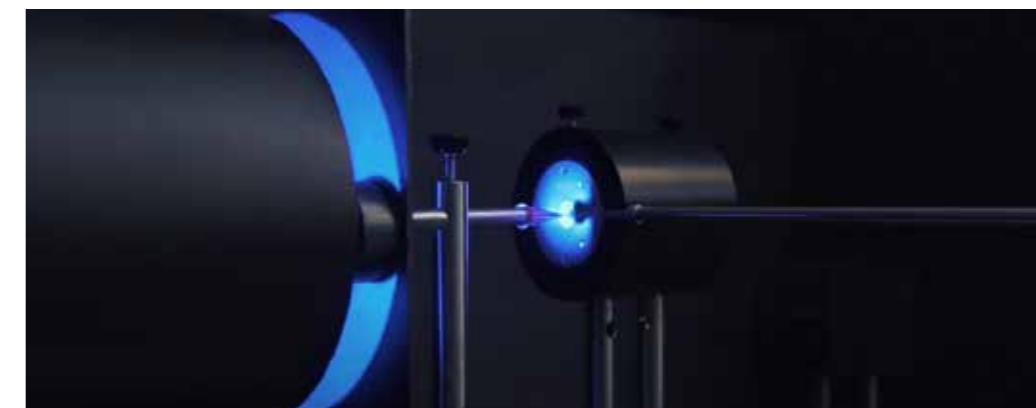
Picture: Kaique Rocha / Pexels

Transfer Standards

The **transfer method** using **calibration standards** is used for the **recalibration** of **measurement devices** that are integrated into **production apparatus** or **online processes**.

This enables **on-site recalibration** by the end user at the appropriate time interval with minimum disruption.

To maintain traceability, the transfer standards themselves need to be periodically recalibrated by Gigahertz-Optik's calibration laboratory.



Picture: Gigahertz Optik GmbH

Gigahertz Optik GmbH

Things You Need to Know About Us

- Many years of experience in the calibration laboratory, with ever-increasing know-how since 1993
- Highly qualified personnel who receive regular internal training by experts
- Calibrations performed by engineers and technicians
- Calibrations supported by proprietary automated software solutions
- Measurement uncertainty determination according to the latest CIE 198 standard
- Traceable calibrations through DAkkS accreditation (D-K-15047-01-00)
- The DAkkS* laboratory fully complies with DIN EN ISO/IEC 17025:2018
- Regular participation in round robin comparisons
- Complete device history for own products dating back for at least 10 years
- Comprehensive calibration certificates, also for factory calibrations, including traceability and calibration uncertainties

Our Life is Light



About Us

About Us

An Introduction to Our Calibration Laboratory

DAkkS Calibrations:

- Spectral irradiance
- Spectral sensitivity
- DAkkS accreditation D-K-15047 (DIN EN ISO/IEC 17025:2018)
- Annex to the Accreditation Certificate D-KL-15047 (DIN EN ISO/IEC 17025:2018)

DAkkS Testing:

- DAkkS accreditation D-PL-15047 (DIN EN ISO/IEC 17025:2018)
- Annex to the Accreditation Certificate D-PL-15047 (DIN EN ISO/IEC 17025:2018)

Factory Calibrations:

- All photometric and radiometric parameters traceable to a National Metrology Institute (NMI) such as PTB or NIST
- Current calibrations
- Contract measurements such as f2 field of view (Cos FOV) and many more

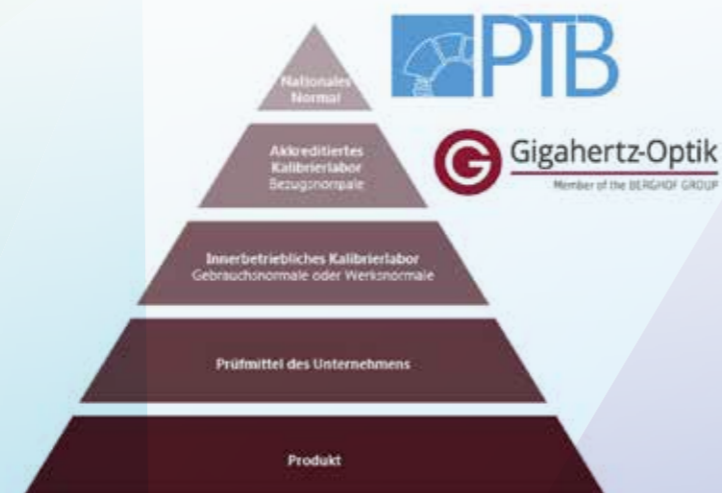
Applied Standard and Test Methods:

- On our webpage you can find a list of standard and test methods we use and our scope of application.

Benefits for All:

The calibration laboratory is committed to meeting customer needs and maintains close customer contact. For example, customer-specific calibrations to optimally meet your application are possible. Through close cooperation with the development department of Gigahertz-Optik GmbH, new insights into product improvements are constantly being incorporated. At the same time, new products also benefit during the development phase through the optimally equipped calibration laboratory and its possibilities.

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Traceable Measurement Results - ISO 17025



Optical Radiation Calibration Laboratory

Optical radiation calibration for a wide range of radiometric and photometric quantities is the key to our quality assurance program. Highly qualified lab personnel develop and implement strategies for traceable calibrations for every Gigahertz-Optik product.

In order to meet the calibration demands four full line of multifeatured instruments the calibration laboratory, with a working area of more than 300 m², maintains a wide assortment of traceable high quality test and measurement equipment as well calibration standards.



Picture: Gigahertz Optik GmbH

Accredited Calibrations since 1993

Our calibration laboratory was accredited by the German Calibration Service and the German National Metrological Institute in 1993 (reg. no. DKD-K-10601).

In 2009 it was ISO/IEC/EN 17025 accredited as a calibration laboratory by DAkkS (reg. no. D-K-15047-01-00) for the quantities of spectral irradiance and spectral responsivity.



Picture: Pixabay / Pexels

Standard-compliant measurement devices

Besides traceable calibration another primary factor that can affect the quality of measurement is how well the measurement device fulfills the requirements of a published standard.

Gigahertz Optik GmbH engineers devote a significant amount of time ensuring that the measurement geometry of each type of instrument complies with the relevant international guideline or standard.



Picture: Gigahertz Optik GmbH



SILVER SUPPORTIVE MEMBER

International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

Service & Recalibration

All Gigahertz-Optik instrumentation is delivered calibrated and certified as applicable. Periodic recalibration at manufacturer recommended time intervals is essential for maintaining measurement quality.

We also offer calibration services according to ISO 17025 and calibration of third party products.

Portable meters, detectors and accessory components are typically returned to our laboratory for recalibration.

Measurement devices and systems that are integrated into fixed pro-



Picture: Pixabay / Pexels

duction setups or that cannot be easily shipped due to size constraints are recalibrated using Gigahertz-Optik transfer standards on site.

Solutions for End-Users and OEM-Customers

Comprehensive Product Range

Gigahertz Optik GmbH offers specially designed measurement devices for standardized measurement tasks such as the measurement of illuminance, color temperature, color rendering index and flicker in LED/SSL general lighting.

In addition to high level photometric quality our products are also characterized by their ease of use.

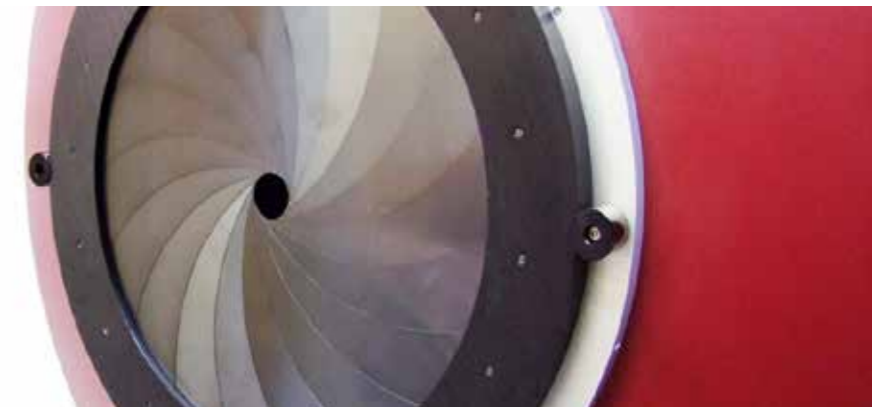


Picture: Ivan Samkov / Pexels

Customized System Solutions

In addition to customized labeling, Gigahertz-Optik GmbH also offers its OEM customers individualized product modifications and comprehensive product upgrades.

Through close collaboration between our product development department and our customers, features and specifications are defined to form the basis for development and subsequent production.



Picture: Gigahertz Optik GmbH

Modular Products for Special Tasks

As a manufacturer of optical radiation measurement devices one of our biggest challenges is the wide range of applications where light and optical radiation measurement equipment may be deployed.

Gigahertz-Optik is able to meet this challenge through its modular concept products and modular systems.

Combining respective modules makes it possible to offer cost-effective individual solutions.



Picture: Pixabay / Pexels

Product Label for OEM Customers

Some of our customers require measurement instruments which they can integrate into their own systems or offer them to their customers in conjunction with their own products.

Some of these customers take advantage of the global acceptance of Gigahertz-Optik's products and keep the Gigahertz-Optik labeling. Others choose to private label our products.



Picture: Gigahertz Optik GmbH

Why Choose Us

Sales & Support, R&D, Production and the Calibration Laboratory are located in our German Headquarters.

This ensures fast response times.

Further we provide:

- A Worldwide sales network with experienced partners
- Innovative products and customized solutions
- ISO 17025 calibration and quality thinking
- Established and experience of more than 35 years
- Many renowned customers
- Extensive Equipment to guarantee best product quality

Exemplary listing of laboratory equipment to get a feel for the possibilities and quality we offer:

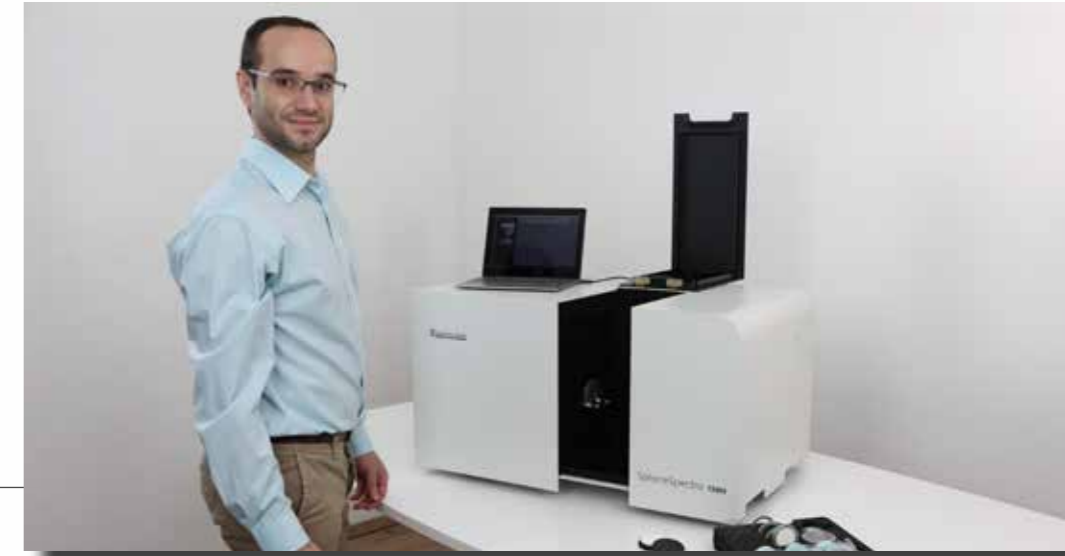
- Entire laboratory temperature-controlled
- Optical setups according to the highest standards (irradiance, radiant intensity, radiant flux, radiance, illuminance, luminous

intensity, luminance, as well as spectral quantities from UV to IR)

- 10m optical bench for linearity measurements, calibration of working standards, etc.
- Integrating spheres of various sizes – detector spheres for luminous flux and radiant power measurements as well as uniform light sources as luminance and radiance standards
- Goniometer for reference measurements of luminous flux and light distribution curves
- Traceable photometric standards from PTB or NIST
- DAKS-traceable calibrated current source
- Climatic chamber (temperature and humidity) for the investigation and optimisation of own products
- Variable-frequency laser (OPO) for spectral investigations of the highest quality, such as scattered light matrix determination of

array spectroradiometers or spectral sensitivity measurement that are not influenced by the optical bandwidth of the illumination source

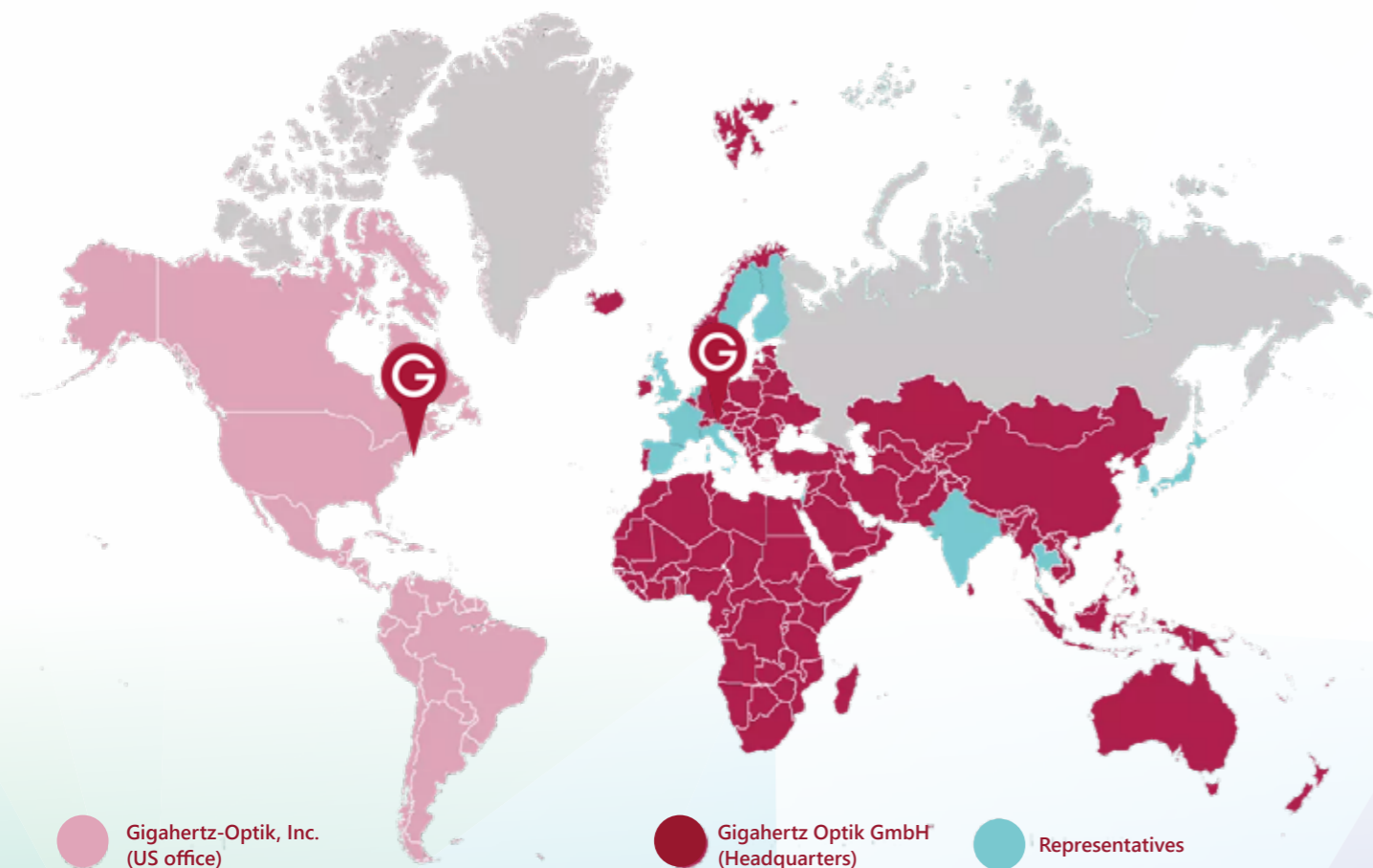
- Various double monochromators from UV to IR for precise and low-scatter calibrations
- Separate lamp and measuring rooms
- We meet the increasing requirements placed on the quality and the reliability of our products, for example by accelerated artificial ageing with respect to temperature and UV irradiation.
- Wide range of necessary electrical measurement equipment (multimeters, digital and analogue oscilloscopes, frequency generators, power sources, etc.)



Some Reference Examples



Find Us



Follow us on Social Media or leave us a review on Google:



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www.gigahertz-optik.com



Gigahertz-Optik

Member of the BERGHOF GROUP

With its innovative and high-quality products as well as application solutions, Gigahertz-Optik enjoys a high regard from its international customers within the field of optical radiation measurement technology. As a manufacturer, Gigahertz-Optik offers standard and custom-made solutions. Regular investments in new technologies ensure that Gigahertz-Optik is able to offer modern measuring solutions to its customers in industry and science.

Broadband light measurement devices

- UV radiometers
- Photometers
- Light hazard meters
- Laser power meters
- NIR radiometers

Spectral light meters

- Handheld devices
- High-end devices
- UV-VIS-IR Spectroradiometer
- Weather-proof devices
- Light transmission

Complementary products

- Integrating spheres
- Integrating sphere light sources
- Calibration standards
- Electronics, optomechanics
- Optically diffuse materials

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General Gigahertz Optik Brochure 2022

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