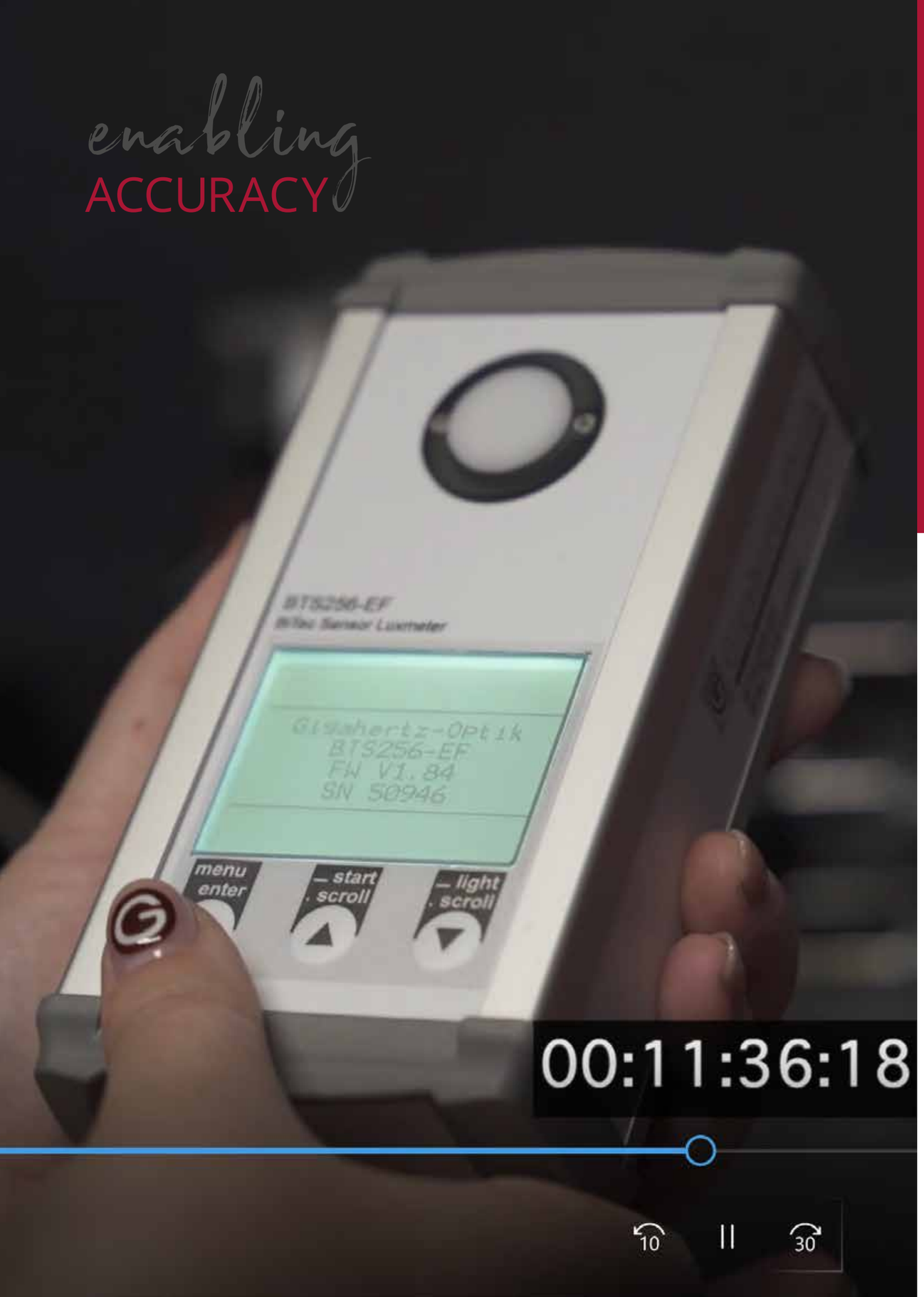
Gigahertz-Optik

Member of the BERGHOF GROUP

LIGHT MEASUREMENT SOLUTIONS

for General and Specialized Lighting

enabling ACCURACY



General & Specialized Lighting

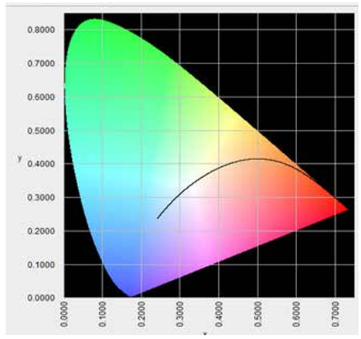
Modern lighting can be designed to not only support people's visual performance requirements, but also to support emotional and biological needs. This is all possible in conjunction with high energy efficiency. The applications of artificial lighting are diverse and wide-ranging. Solid-state lighting also promotes intelligent concepts in existing applications and opens up many new applications.
Solid-state lighting products and installations require light meters that meet the increasing demands of their development, manufacture, qualification and use. The measurement tasks now required go far beyond those of the incandescent lamp age.
Gigahertz-Optik develops, produces and calibrates light measuring devices for all contemporary general lighting products as well as for many specialist lighting applications. This brochure gives an overview of the diverse range of measurement solutions that are possible with the products from Gigahertz-Optik.

- Lighting Quality
- Light Transmission
- LED Measurement Solutions
- Calibrations
- Health and Wellbeing
- Light Hazard
- Horticultural Lighting
- UV Measurement
- Integrating Spheres
- Laser Radiation
- Photomedicine

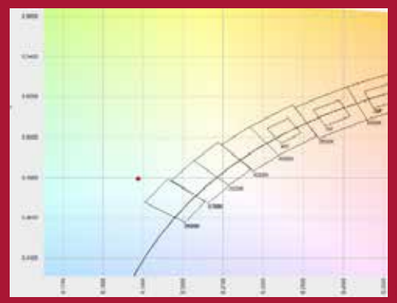
Lighting Quality

Color

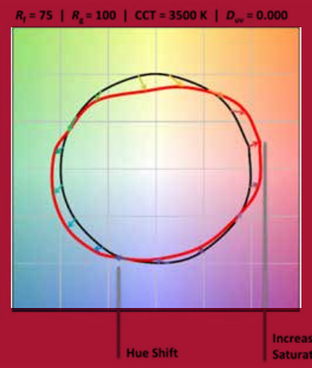
The near limitless color possibilities of LED lighting creates many opportunities for lighting designers and requires a range of suitable color quality metrics. Color temperature, CCT, is a widely used 'light quality' indicator even though different color light sources can have the same CCT. The CIE general color rendering index, CRI Ra, is also widely specified for lighting products. The limitations of the CIE CRI system have been well investigated with respect to LEDs and alternatives such as the IES TM-30-18 system has been widely adopted meanwhile. Spectral measurements are the basis for all such metrics and hence our spectral light meters are recommended for all solid-state lighting (SSL) applications.



CIE 1931 Chromaticity diagram



CCT Color temperature



IES TM-30-18

CIE Color Rendering Indices

Solutions

MSC15 Spectral Light Meter

- Low-cost spectral light meter
- Color touchscreen operation
- CIE chromaticity display
- Spectral power distribution

BTS256-EF Spectral Light & Flicker Meter

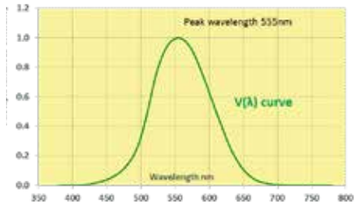
- Comprehensive colorimetry
- Full CIE S026:2018 metrics
- Flicker measurement
- Wi-Fi option

CSS-45 Spectral Sensor / CSS-D Display

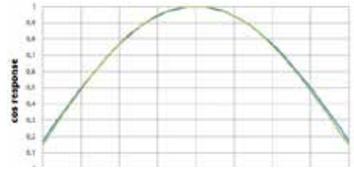
- Remote operation RS485/USB
- Multi-sensor configurations
- Smart spectral sensor
- CSS-D display option

Illuminance

Illuminance is a measure of the total luminous flux incident on a surface per unit area and is measured in terms of lux. It is fundamentally important when assessing the quality of lighting. CIE 231:2019 "CIE Classification System of Illuminance and Luminance Meters" defines an extensive set of quality indices of which the two most important for solid state lighting are spectral mismatch, f1' and cosine error, f2. Spectral mismatch arises from the non-perfect V(λ) response of filter based illuminance meters and is usually the most significant error source when such lux meters are used to measure LEDs. Spectral light meters largely eliminate this inherent error of broadband light meters and are therefore generally recommended for solid state lighting applications. A good cosine response is most important for measuring extended light sources as found in most room and area lighting situations.



The CIE V(λ) curve describes the average spectral sensitivity of human visual perception of brightness.



As light deviates from normal incidence, its area increases on the surface. The resulting reduction in irradiance is determined by the cosine of the angle of incidence.

Solutions

X1-1 / VL-370x Illuminance Meter

- VL-3701 Precision V(λ) match
- VL-3705 Scotopic illuminance
- VL-3707 Low illuminance level

MSC15 Spectral Light Meter

- Eliminates spectral mismatch errors
- Full colorimetric data, including CRI Ra
- Intuitive touch screen operation

Emergency and Security Lighting

While spectral light meters are generally recommended for most solid state lighting applications, broadband light meters (i.e. filter and photodetector based photometers and radiometers) offer some advantages including very fast measurements, high sensitivity, additional wavelength ranges and the ability to configure multiple detector based systems. For example, emergency lighting standards (e.g. DIN EN 1838 and ISO 30061) require measurement resolution in the mlux range. Some security lights incorporate NIR LEDs so require irradiance measurements in the 800 nm – 1000 nm range.

Solutions

VL-3707 Low Illuminance Level

- Range 100 µlx to 80,000 lx

P-9802 Multi-Channel Light Meter

- Up to 36 detector channels

RW-3704 NIR Irradiance

- 800 nm to 1000 nm detector

Health and Wellbeing

Flicker

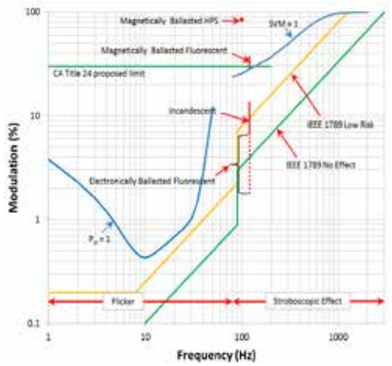
The detrimental health effects of light flicker such as triggering photosensitive epilepsy and stroboscopic effects are well known. Flicker is not an intrinsic characteristic of LEDs but a result of the drive and control circuitry employed. Therefore, quality lighting products and installations should be assessed for flicker in addition to photometric and colorimetric properties.

The variation in light output over time from a light source can have both visual and non-visual detrimental effects on the observer, collectively referred to as 'Temporal Light Artefacts' (TLAs). Visually perceptible TLAs include flicker, stroboscopic effects and phantom array effects.

Non-visual TLAs are reported to have various physiological and psychological effects such as migraines, epileptic seizures, autistic behaviour, vertigo, etc.

Latest regulations and standards require greater assessment of TLA's than can be provided by simple metrics such as flicker index.

The European ecodesign Regulation (EU) 2019/2020 imposes strict requirements for flicker and stroboscopic effect. The metric used for flicker is 'PstLM', short-term flicker severity, and the metric used for stroboscopic effect is 'SVM', stroboscopic visibility measure. The limits in this new EU directive are set as PstLM < 1.0 and SVM < 0.4.



- Percent Flicker (IEEE Std 1789-2015, IES: RP-16-10, CIE: TN-006)
- Flicker Index (IEEE Std 1789-2015, IES: RP-16-10, CIE: TN-006)
- FFT Frequency Component Analysis
- Pst LM Short Term Flicker Severity (CIE: TN-006, IEC TR 61547)
- SVM, Stroboscopic Visibility Measure (CIE: TN-006, IEC TR 63158)
- Mp ASSIST Flicker Perception Metric
- Joint Appendix JA10

Solutions

BTS256-EF Spectral Light and Flicker Meter

- Comprehensive flicker, photometric and colorimetric measurements
- Ecodesign testing for PstLM flicker and SVM stroboscopic metrics.

PFL-200 Fast Flicker Meter (amplifier)

- Flicker measurement according to: CIE:TN-006, IEC TR 61547, IEC TR 63158, Mp ASSIST, JA10, IES:RP-16-10, IEEE 1789-2015,
- For all photodiode detectors (photovoltaic operation)

LPS-CH-500 Waveform Generator

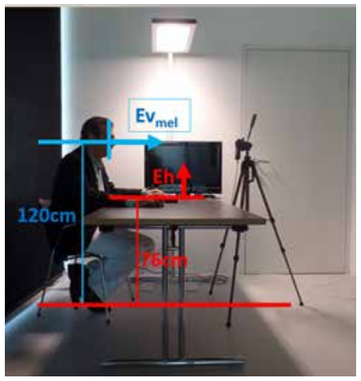
- PstLM immunity measurements according to IEC TR 61547-1:2017.
- Power line disturbance simulations and programmable output impedance.
- Compliance tests against IEC 61000-4-11 and IEC 61000-4-13/-14/-28.

Human Centric Lighting

Contemporary scientific knowledge combined with the spectral flexibility of LEDs offers many possibilities to improve human health and wellbeing through lighting installations.

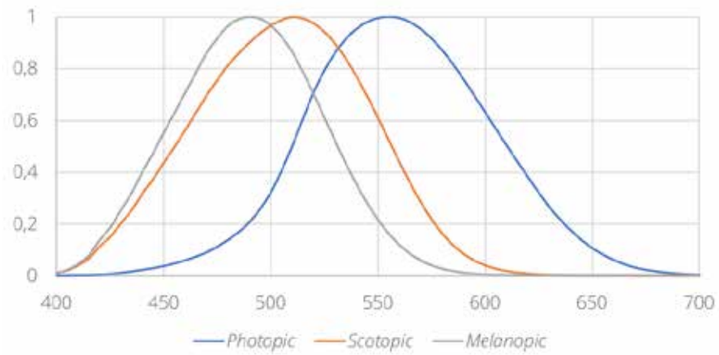
Light is one of the primary drivers of our circadian rhythm, our 'internal body clock'. Assessing the effectiveness of circadian lighting systems requires the measurement of melanopic illuminance, a standard feature of our spectral light meters.

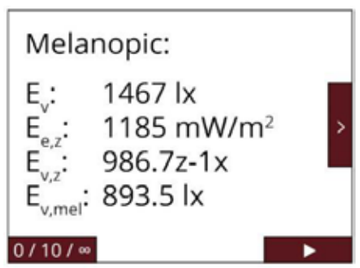
The CIE publication S026:2018 "System for Metrology of Optical Radiation for ipRGC-influenced responses to light" provides metrics to characterize the non-visual stimulus of light. Emerging standards, such as the "WELL Building Standard", give recommendations for non-visual requirements of lighting. The melanopic stimulus metric, based on the intrinsically photosensitive retinal ganglion cells (ipRGC), together with the spectral composition of the lighting environment, are fundamental to understanding in this field.



Solutions

MSC15 Spectral Light Meter





- Low-cost spectral light meter
- Melanopic irradiance
- Equivalent melanopic lux
- Melanopic daylight equivalent illuminance

CSS-45 Remote Spectroradiometer Sensor / CSS-D Display

- WELL Building standard performance verification
- Dual sensor head configurations
- Simultaneous horizontal and vertical illuminance

BTS256-EF Spectral Light and Flicker Meter

- Full CIE S026:2018 metrics
- Flicker measurement

Health and Wellbeing

Indoor Work Places

The European standard, EN 12464-1, defines lighting requirements for indoor work areas. It specifies measurement criteria based on the intended use of the lighting including the minimum required average illuminance per task (referred to as “maintained illuminance”) and the minimum required color rendering (specified as a minimum CIE Ra value).

The spectral distribution of SSL can be very different to that of traditional lighting technologies resulting in potentially significant errors in illuminance measurements made with traditional lux meters.
Color rendering index requires the measurement of the spectral power distribution of the light.
Therefore, both measurement requirements are best satisfied by light meters with full spectral measurement capability .

Solutions

BTS256-EF Spectral Light and Flicker Meter

- Full photometric and colorimetric capabilities
- Assessment of light flicker and stroboscopic effects
- Human Centric Lighting metrics
- Data logging

MSC15 Spectral Light Meter

- Eliminates spectral mismatch errors
- Full colorimetric data, including CRI Ra
- Intuitive touch screen operation

Light Pollution

Light pollution of the night sky resulting from the ever increasing use of artificial lighting is impacting both wildlife species and ecosystems as well as having possible detrimental effects on humans. Research requires the accurate measurement of low level illuminance.

Solutions

VL-3707 low level illuminance detector with P-9710 multi-functional light meter

- Very low light level photometer with wide dynamic range down to < 0.1mlx
- Precision photometric match and cosine response for accurate measurement of the night sky and all artificial lighting types.

Horticultural Lighting

LED Grow Lights

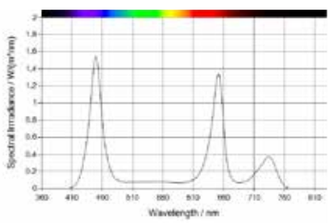
The wavelength selectability and energy efficiency of LEDs make them well suited as artificial grow lights in indoor vertical farms as well as for use as supplementary lighting in greenhouses. The intensity and spectral composition of light can be used to control a plant’s growth rate, shape and flowering. Our spectral light meters allow researchers and growers to develop, optimize and monitor the ‚lighting recipes‘ employed thereby offering significant advantages over traditional quantum PAR sensors.

Photosynthetically Active Radiation, PAR, is just a descriptive term for radiation within the 400 nm - 700 nm wavelength range. The commonly used quantitative PAR terms are:

- Photosynthetic Photon Flux (PPF), µmol/s: measurement of the total number of photons emitted by a light source each second within PAR wavelength range. Analogous to ‘lumen’ for visible light.
- Photosynthetic Photon Flux Density (PPFD), µmol/m²/s: measurement of the total number of photons within PAR wavelength range that reach a surface each second measured over a one square meter area. Analogous to ‘lux’ for visible light.
- Day Light Integral (DLI), mol/m²/d: cumulative measurement of the total number of photons within PAR wavelength range that reach a surface during 24 hour period, measured over a one square meter area.

Solutions

MSC15 Spectral Light Meter



- Low-cost spectral light meter, ideal for routine measurements of LED lighting within horticulture
- PAR PPFD µmol/m²/s

BTS256-EF Spectral Light and Flicker Meter

- Enhanced spectral light meter, ideal for horticultural research
- Day Light Integral (DLI), mol/m²/d:
- Ratio functions, e.g. red/far red
- Programmable weighting functions
- Data logging

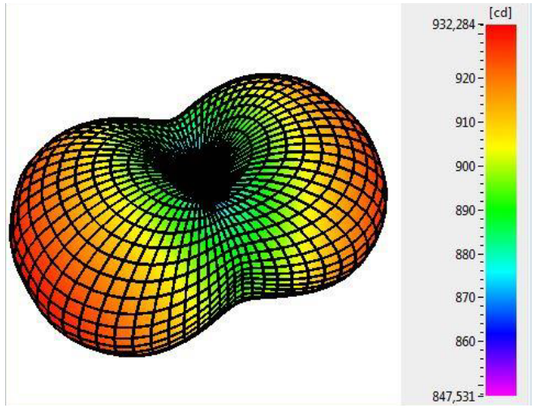
CSS-45 Remote Spectroradiometer Sensor

- Ideal for unattended monitoring
- Multiple CSS-45 sensor configurations using RS485 interfaces
- IP65 version CSS-45-WT

LED Measurement Solutions

LED / SSL Testing

The quality of LED / Solid State Lighting products supplied worldwide varies from excellent to very poor. Accurate performance claims require appropriately configured systems incorporating integrating spheres, goniometers and intensity adapters. Latest standards such as CIE S025 should be adhered to. Traceable calibration of equipment, supplied as standard with all our products, is essential.



The optical parameters that are required to be measured in the development and production processes of SSL include:

- Luminous flux and chromaticity including CCT of the LED
- Luminous flux and chromaticity including CCT of the LEDs assembled on PCBs
- Luminous flux and chromaticity including CCT of the LED with optics
- Luminous intensity
- Luminous intensity spatial distribution

These photometric and colorimetric measures require a selection of input optics configured with a suitably calibrated spectroradiometer. With the BTS256-LED Plus Concept, Gigahertz-Optik GmbH offers an affordable spectroradiometer with accessories for all of the above listed measurement tasks.

Solutions

BTS256-LED Plus Concept

- Luminous flux: BTS256-LED for on-board LEDs
- Illuminance: BTS256-LED-DA diffuser window
- Luminous intensity: BTS256-LED-IB CIE 127 B
- Luminous flux: ISD-xx external integrating spheres
- Intensity distribution: GB-GD-360-RB40-2 goniometer

BTS2048-Series Spectroradiometers

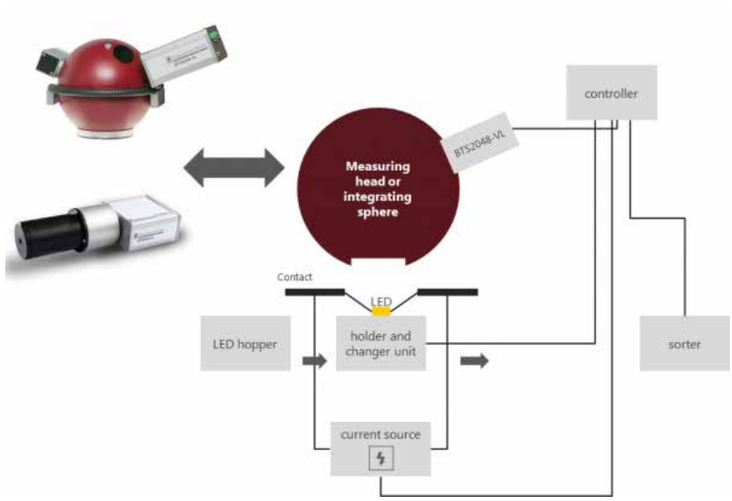
- Compact, fast, high precision
- Use with ISD-xx integrating spheres
- Optional fibre optic coupling
- UV and NIR variants

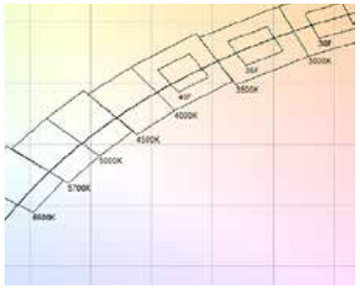
ISD-xx Integrating Spheres

- 15 cm to 100 cm diameter spheres
- For 2-Pi and 4-Pi measurements
- Bench / floor stand

LED Binning

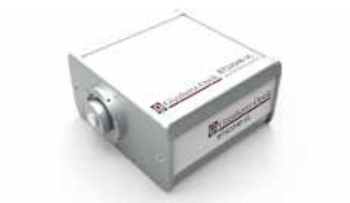
Despite the most sophisticated manufacturing technologies employed by the semiconductor industry, light output and color temperature varies from chip to chip. Therefore, binning is employed to maximise yields and to categorise products. Suitable spectroradiometers, exemplified by the BTS2048 series, must offer high speed and high precision measurement of flux and color as well as versatile interfaces for incorporation into wafer probing systems. Standards such as ANSI C78.377-2017 define tolerance bands or 'bins' with respect to chromaticity boundaries. Therefore, without exception, LED binning requires the absolute spectral power distribution of devices to be measured in order to precisely determine the light output and the correlated color temperature (CCT) of each individual LED. Light output is most commonly measured in terms of luminous flux (lm) although Average LED Intensity is also sometimes specified.





Solutions

BTS2048-VL Spectroradiometer



- High speed, wide dynamic range
- Time-synchronized, pulsed measurements as per CIE S025 and DIN 5032-9
- Direct mount to integrating spheres
- Fibre coupling option

ISD-15 / ISD-25 Integrating Spheres Spectroradiometer

- High speed, wide dynamic range
- Time-synchronized, pulsed measurements as per CIE S025 and DIN 5032-9
- Direct mount to integrating spheres
- Fibre coupling option

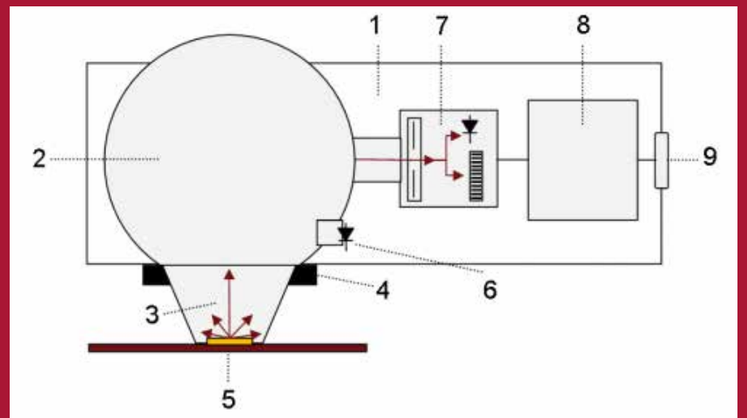
CP-ILED-B-IS-1.0-HL CIE 127 B Average Intensity

- Average LED Intensity as per CIE 127 B
- Monolithic module for system integration
- Compact internal integrating sphere ensures uniform active area

LED Measurement Solutions

Board Mounted LEDs

The particular current drive conditions as well as the thermal design of the LED carrier board and associated heatsink can significantly influence the optical performance of any assembled LED module or product. Typically, the end use operating parameters differ significantly from the current pulse operation and stable junction temperature of 25°C used in the original LED binning process. Therefore, it is frequently necessary to test individual LED performance in-situ. The two possible measures of the light intensity of assembled LEDs are luminous flux (lm) and luminous intensity (cd).



1) BTS256-LED housing 2) 50mm integrating sphere 3) Conical measurement port 4) Precision bayonet mount 5) LED device under test 6) Remote-controlled auxiliary lamp 7) BiTec spectrometer and Si detector 8) Microprocessor 9) USB 2.0 interface

The BTS256-LED tester incorporates an integrating sphere in conjunction with its BiTecSensor technology enabling the direct measurement of the luminous flux, spectral power distribution, CCT and color rendering (CIE CRI and IES TM-30-18) of in-situ LEDs. The cone-shaped measuring aperture of the integrating sphere is simply positioned over the assembled LED for measurement.

Temperature Effect on LED Performance

Good thermal design of LED light sources and luminaires is essential to ensure optimum LED performance with respect to light output and lifetime. LEDs do not radiate significant amounts of heat but within the LED's semiconductor junction heat is generated which must be dissipated by convection and conduction. The internal quantum efficiency of LEDs decreases as the junction temperature increases. Junction temperature increases as the current through it is increased. Therefore, the operating junction temperature is determined by the drive current, ambient temperature and the efficiency of the heatsink design.

The TP121-TH LED testing system provides fully automated testing routines for SMD and on-board LED devices.

The system's photometric, colorimetric, thermal and electrical measurement parameters all conform to the latest standards and regulations including CIE S025, IES LM-79-08, and DIN 5032 Part 9.

Solutions

BTS256-LED Tester

- Easy in-situ LED measurements

BTS256-LED Plus Concept

Accessories to extend measurement capabilities:

- Illuminance - BTS256-LED-DA diffuser window
- Luminous intensity – BTS256-LED-IB CIE 127 B Average LED Intensity
- Luminous flux – ISD-xx external integrating spheres
- Illuminance distribution - GB-GD-360-RB40-2 goniometer

Solutions

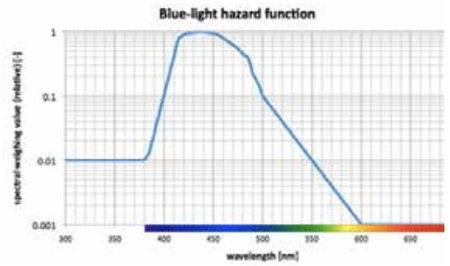
TPI21-TH LED Test System

- Automated test routines
- Fast temperature control
- High speed precision spectro-radiometer
- Motorized integrating sphere positioning
- Pulsed and CW current drive
- Interchangeable LED mounting adapters

Light Hazard

Blue Light Hazard

Optical radiation is capable of causing damage to our skin, the front surface of our eyes and our retina. Currently, Blue Light Hazard in the 300-700nm region is of primary interest for LED lighting but UV Hazard may become more significant as such technologies develop. These parameters require specialist measurement devices with specific spectral weighting functions and geometrical properties.



Hazard	Wavelength Range (nm)	Bioeffect	
		Eye	Skin
Actinic UV	200-400†	Cornea - Photokeratitis Conjunctiva - Conjunctivitis Lens – Cataractogenesis	Erythema Elastosis
Near UV	315-400	Lens – Cataractogenesis	
Blue Light	300-700†	Retina – Photoretinitis	
Retinal Thermal	380-1400†	Retina - Retinal burn	
IR Radiation Eye	780-3000	Cornea - Corneal burn	
Thermal Skin	380-3000		Skin burn

† Spectral weighting factor applied

For general lighting service products IEC TR 62778 „Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires" is most relevant.
The European Directive 2006/25/EC lays down minimum requirements for the protection of the health and safety of workers from the risks related to artificial optical radiation.
Hazards relating to skin and the front surface of the eye require the measurement of irradiance whereas hazards to the eye itself require the measurement of radiance. EN 62471:2008 considers hazards with respect to exposure over a period of up to eight hours.

Solutions

X1-3 Light Hazard Meter

- Ideal for workplace safety checks in accordance with 2006/25/EC and DIN EN 14255-1
- XD-45-HB blue light hazard detector
- XD-45-HUV hazard detector for UV actinic and UV-A radiometric irradiance

BTS2048-VL-TEC with LDM-1901
Photobiological Safety Spectroradiometer

- Photobiological safety testing in accordance with IEC/ EN 62471 and IEC TR 62778
- LDM-1901 telescope with 100 mrad, 11 mrad, and 1.7 mrad FOV
- Camera-based viewfinder
- Spectroradiometer 300 to 1050 nm

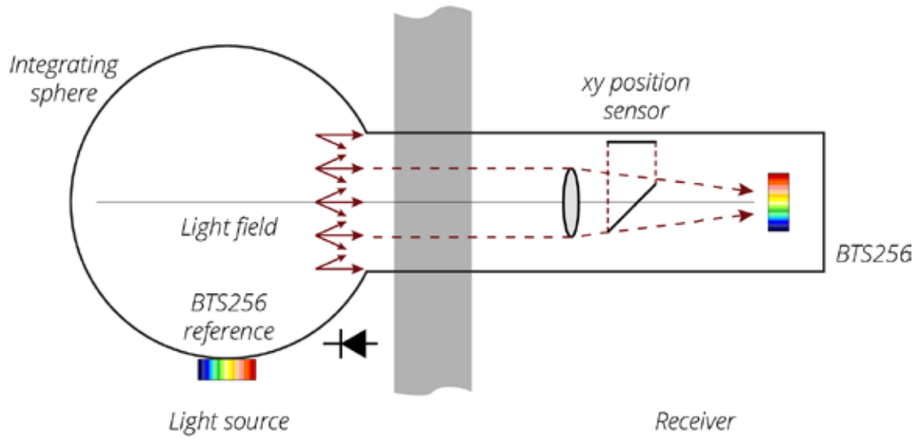
X1-UV-3725/6/7
UVC Radiometer

- UVC radiometer for measuring germicidal efficacy and health hazard of low pressure Hg light sources
- Four-channel USB Optometer with separate UVC irradiance detector with traceable calibration
- Cosine weighted response for accurate irradiance measurements

Light Transmission

In-Situ Light Transmission

The light transmission of window glazing, vehicle windscreens, protective shields etc. needs to be evaluated with respect to the photometric sensitivity of the human eye. Conventional measurements with laboratory based spectrophotometers permit only relatively small samples to be measured. Large panes of glass and windscreens must first be cut into suitably small samples. Portable spectrophotometers on the other hand, make it possible to measure the light transmission of large samples in-situ.



Solutions

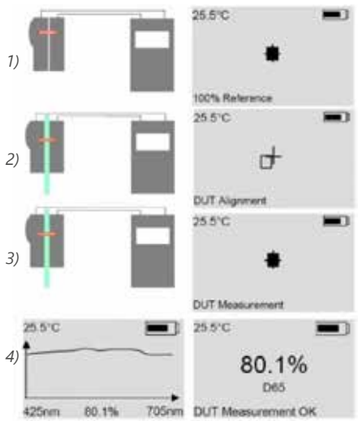
LCRT-2005-S light transmission device

The LCRT-2005-S is specifically designed for light transmission measurement of thin, scratched and clear samples. The measurement geometry comprises an integrating sphere light source and a luminance measurement device.

The monitor detector of the light source and that of the receiver are both spectrometers enabling precise simulation of standard light spectra and photometric responsivity in the receiver.

The sample is aligned in front of the light source for measurement. The degree of light transmission can thus be determined through diffuse sample illumination for thin scratched samples as well.

- Spectral transmission in d/0 and 0/0 geometries
- Autom. ambient light compensation
- Alignment camera
- Photometric transmission with A, C and D65 illuminants
- Hand-held portable measurements



Freehand light transmission measurement: 1) 100% adjustment 2) sample alignment (DUT) 3) automatic measurement start upon setup 4) Display of the measurement values

Integrating Spheres

Standard Integrating Spheres

Gigahertz-Optik manufacturers a range of standard integrating spheres for use with both BTS2048-series and BTS256-LED spectroradiometers. These configurations offer convenient and accurate measurement of luminous flux, spectral power distribution, color, and color rendering indices of LED devices and solid state lighting products.

Solutions

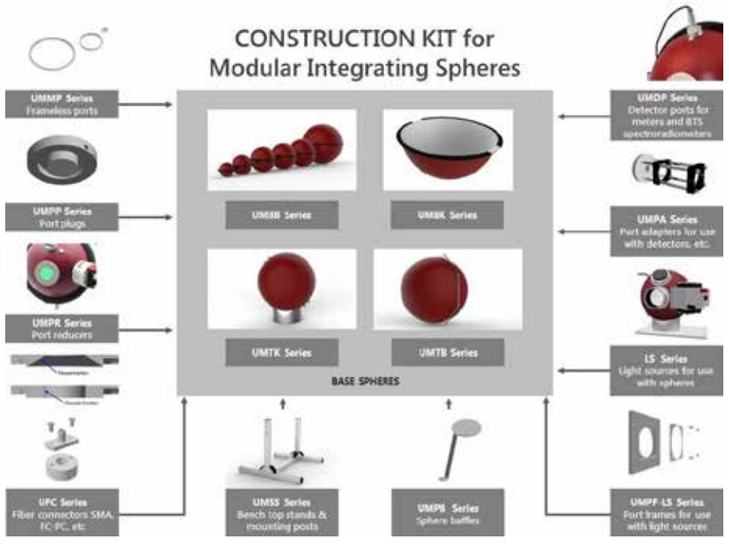
ISD-xx Integrating Spheres

- Sphere diameters 15 cm to 100 cm
- Auxiliary lamp
- Internal lamp holder for 4-Pi lamps

- Sample holder height adjustment
- Various port sizes for 2-Pi lamps

Customizable Integrating Spheres

In addition to our range of standard integrating spheres, Gigahertz-Optik offers a universal kit for the custom configuration of integrating spheres. The use of standard components provides cost effective and timely implementation. Complete measurement system solutions are provided.



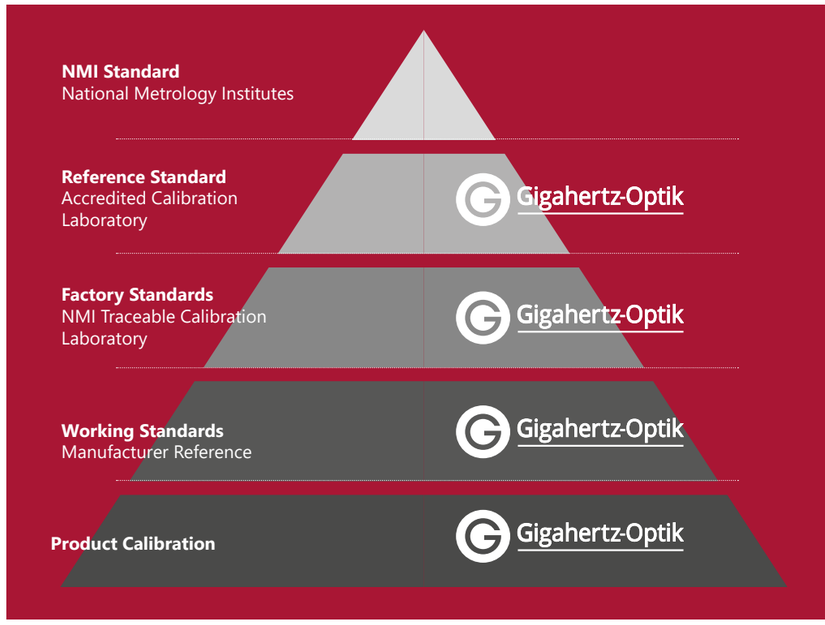
Calibration

Calibration You Can Trust

Calibration is a prerequisite for maintaining accuracy in any type of measurement instrument. Therefore, Gigahertz-Optik has always invested heavily to ensure that it is able to offer the highest quality traceable calibrations. Gigahertz-Optik's calibration laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (D-K-15047-01-00) for spectral responsivity and spectral irradiance according to ISO/IEC 17025. Calibrations carried out by DAkkS accredited laboratories offer a secured traceable link to national calibration standards. This is of critical importance for instrument and testing equipment manufacturers in order to be competitive in national and international markets and is absolutely necessary for any quality management system.

Calibration Standards

Besides providing traceable calibration of all our measuring devices and systems, Gigahertz-Optik offers a range of calibration standards including reference lamps, detectors and reflectance standards for the calibration and adjustment of optical radiation measurement devices.



Traceability pyramid shows the unbroken chain of feedback from product calibration to NMI standard.

Solutions

BN-9101 1000W FEL
Spectral Irradiance

BN-LH250 250W QTH
Spectral Irradiance

BN-LLSF-2P
LED based calibration standard

BN-Rxx-D2
Spectral Reflectance

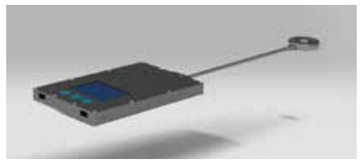
UV Measurement Technology

UV Curing

The high intensity UV radiation used for curing processes places special demands on the radiometers used to control the exposure of work pieces to the UV. Gigahertz-Optik has developed low profile devices for both gas discharge lamps and UV LEDs that are able to withstand the high temperatures involved whilst accurately measuring UV intensities over a very wide dynamic range (from 1 mW/cm² to 40,000 mW/cm²).

Solutions

BTS256-UV UV Spectroradiometer



- Spectroradiometer 200 nm-550 nm
- Ideal for UV LEDs and process development
- Stainless steel housing
- Conveyor belt / handheld operation

X1-1 / RCH-116 Irradiance Meter

- UV LED calibration wavelengths
- Low profile sensor
- Safe operator handling
- Detectors for gas discharge lamps

UV LEDs

UV LEDs are now frequently replacing conventional UV sources as well as creating many new applications. Therefore, the accurate and traceable measurement of UV LEDs has become increasingly necessary. The measurement of spectral irradiance and spectral radiant flux are generally required. However, UV measurements encounter more challenges than similar visible light tasks due to a number of issues including detector sensitivity, calibration, stray light and fluorescence.

Solutions

BTS2048-UV UV Spectroradiometer

- 200 nm - 430 nm optimised
- Integral diffuser
- Direct mount to spheres
- Fibre coupling option

TFUV10 UV LED Spectral Radiant Flux Measurement System

- Turnkey system
- Fluorescence free
- UVA, UVB and UVC LEDs
- Spectral radiant flux

Sun Tanning Lamps

The compliance and safety testing of sun tanning equipment in accordance with EU regulations and product standards (EN 60335-2-27 and DIN 5050-1) requires the measurement of erythema effective irradiance and checking for any UV-C content.

Solutions

X1-4 / XD-45-ERYC Erythema + UVC Meter

- On-site measurements
- Multi-sensor detector
- Erythema (UVA + UVB) and UVC

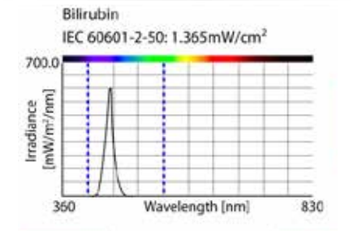
Photomedicine

Blue Light Phototherapy

Blue light phototherapy is the most common therapeutic intervention used for the treatment of unconjugated neonatal hyperbilirubinemia. The measurement of irradiation intensity prior to each therapeutic treatment is recommended. Hitherto optimising treatment dosimetry has been hindered by the large variability of measurement data produced by the many proprietary broadband radiometers employed, each with its specific spectral response and typically tailored to specific lamp or LED types. The MSC15-Bili spectral light meter eliminates all these issues.

Solutions

MSC15-Bili Spectral Light Meter



Individual display screens for each of the following metrics:

- AAP 2004 Guidance, 430 nm – 490 nm average irradiance in µW/cm²/nm
- AAP 2011 Guidance, 460 nm – 490 nm average irradiance in µW/cm²/nm
- IEC 60601-2-50 Total irradiance for bilirubin, Ebi, 400 nm – 550 nm in mW/cm²
- Spectral irradiance 360 nm – 830 nm including lux, CCT and x,y chromaticity

UV Phototherapy

UV phototherapy is widely used to treat a range of skin conditions such as psoriasis. Accurate patient dosimetry is important to ensure that patients can be treated consistently and to ensure that a patient's absolute cumulative dose of UV radiation can be accurately recorded so that the long-term skin cancer risks can be best managed. UV phototherapy can involve either narrowband or broadband UVB or alternatively UVA which is used in conjunction with a psoralen.

Solutions

UV-3711-308 UV Detector / P-9710 Meter

- For 308 nm excimer sources
- Dose/irradiance with P9710

XD-9501/3 UV Phototherapy Meter

- UVA, UVB and 311nm
- TL01 and TL12 calibrations
- Dose/irradiance with X1 meter

Laser Radiation Measurement

Gigahertz-Optik GmbH produces instruments for measuring optical radiation from the lasers and laser diodes that are widely used in measurement, analytical and telecommunication equipment as well as in sensor technologies. The product range includes instruments for measuring continuous, modulated and pulsed radiation.

Solutions

P9710-2 / ISD-5P-Si

ISD-10/15/30-xx

ISD-3p-xx

P9710-4 / ISD-1.6P-SP

Gigahertz-Optik

Member of the BERGHOF GROUP

Our Vision - Enabling accuracy

enabling ACCURACY

Gigahertz-Optik enables success in challenging light measurement tasks through smart solutions based on the combination of accuracy, reliability, flexibility, ease of use, productivity and innovation recognized by industry and science.

We are your worldwide partner in photonics offering UV to IR measurement equipment through own German development, production, high level support and a high-class ISO 17025 calibration laboratory.

Broadband light measurement devices

- UV radiometers
- Photometers
- Light hazard meters

Spectral light meters

- Handheld devices
- High-end devices
- UV-Vis-NIR 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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