TechnoTeam
Bildverarbeitung GmbH

CAMERA PHOTOMETER

Based on the digital mirrorless camera
Canon EOS RP

LMK
mobile R

Glare rating

With the LMK mobile R, existing guidelines, lighting and illumination systems can be easily verified concerning illumination, glare, ergonomics and potential hazards.

- Glare evaluation of street lighting systems according to the TI method (EN 13201)
- L20° measurement of lighting systems at tunnel portals (CIE Publ. 88)
- Glare evaluation of daylight and artificial lighting indoors (UGR, DGI, DGP etc.)
- Lighting assessment of outdoor lighting systems with regard to glare and light emissions (LAI, GR, etc.)

iOSAPP

LMK mobile R remote

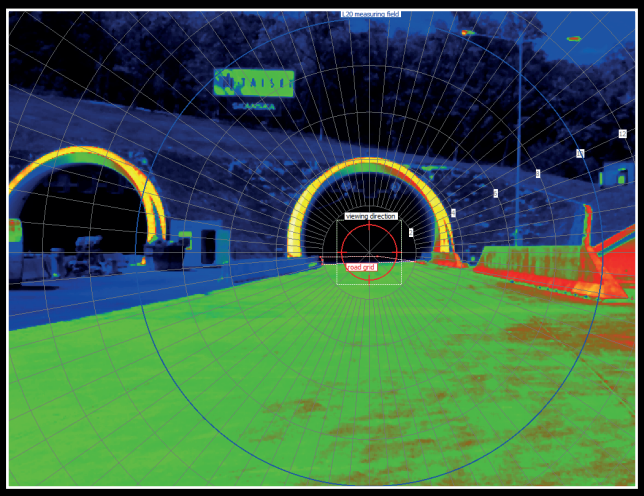
Just install!

LMK mobile R

Determination of indoor glare

There is a distinction between daylight glare and artificial light glare. Depending on the lighting situation and visual task, different metrics are introduced for evaluating glare (UGR, DGI, DGP, etc.). The **LMK** has the metrological prerequisites and properties to solve this measurement task. The included software supports the evaluation according to several glare evaluation methods.

Measurement of L20° luminance in the proximity zone of tunnel portals



For this measurement task, the required measurement data are the average luminance of the roadway in the tunnel portal (entrance section) and the surroundings of the entrance portal in a 20° environment. The alignment of the **LMK** is made easy with the help of the additional geometric calibration.

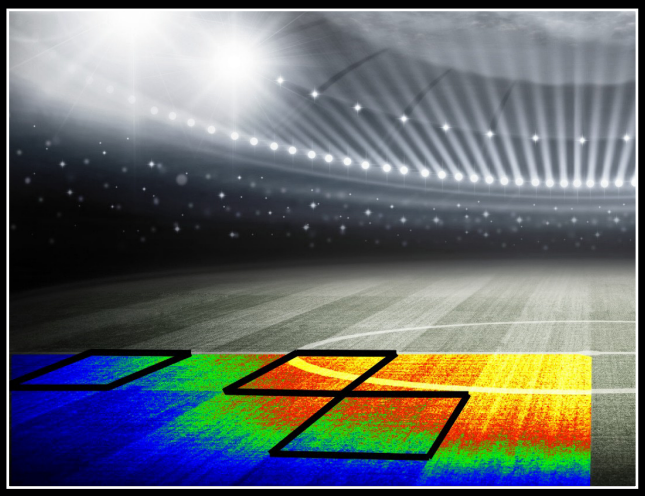
Determination of glare according to the TI method

We differentiate here between daylight glare and artificial light glare. Different metrics have been introduced to evaluate glare depending on the lighting situation and visual task (UGR, DGI, DGP, etc.). The **LMK** has the metrological requirements and characteristics to solve this measurement task. The software supplied supports the evaluation according to several glare evaluation methods.

Luminance distribution and horizontal illuminance measurement on the aircraft parking area

A critical issue for the operational safety of airports is the sufficient illumination of aircraft parking areas. Due to weather conditions in winter and construction works on the ground surface, the airfield lighting system must be constantly adapted. These works are connected with the continuous testing and acceptance of the achieved lighting quality.

Photometric evaluation of outdoor lighting systems



Determination of glare characteristics of artificial outdoor lighting systems, e.g. of sports facilities or outdoor advertising. These include the maximum tolerable luminance (according to LAI), the vertical illuminance or the equivalent veiling luminance.

Evaluation of railway track lighting

In addition to the measured variables and key figures for the visual tasks, such as luminance, uniformity and glare, the **LMK** can also be used to measure quality characteristics for the assessment of light emissions.

Evaluation of roadway lighting conforming to standards

According to the measurement methods described in EN 13201-4, measurements with an **LMK** are considered to be the current technological state of the art. The **LMK** is used here to record a high-resolution measurement image of the road surface under the required observation conditions in order to derive the necessary key figures of luminance and uniformity.

Interior workplace lighting

The photometric evaluation, in accordance with parts of EN 12464-1 is easy with the **LMK**. The measurement of luminance and visually perceived contrasts serves as a measure of the ergonomics of visual tasks.

Road and tunnel measurements

The **LMK** mobile R can be used in various infrastructure lighting applications. The lighting of roads & tunnels, pedestrian walkways, railroads, airports, signaling systems and the lighting of public places.
It can also be used in indoor areas such as warehouses, industrial sites or sports facilities.

Direct photometric measurands are:

- The absolute luminance L
- The luminance distribution L(x,y)
- The vertical illuminance E_v

Measured variables derived from this are, for example:

- Perceived contrast ratios
- Homogeneity of brightness
- Luminous intensity I
- Horizontal illuminance E_h

Using these data, conclusions can be drawn about the visibility or lighting effect of lighting scenarios in terms of safety, ergonomic, ecological and other design aspects.

LIMITATIONS

- The **LMK** mobile R cannot be used for measuring colored light emission spectra.
- Restricted use for the measurement of modulated light sources with strong amplitude modulation.

LMK mobile R

Components

Lenses

Standard AF [35 mm]
Zoom AF [24 – 70 mm]
Fisheye [7.5 mm]

Software

LMK LabSoft
Measuring software

Manuals / certificates

Quick Start Guide **LMK** mobile R
Manual **LMK** LabSoft
Calibration certificate

Optional

Tripod
Neutral density filter
Single or as set
(density: 1.0; 2.0; 3.0)

Transport

Camera bag + carrying strap
TechnoTeam transport case

Metrological specifications

Measurement Electronics

Sensor / resolution	CMOS, Canon APS-C
File format	14-bit, Canon original RAW 3rd Edition
PC-Interface	CR3 image file transfer to PC with USB3.0 or WiFi

Measurement results

Luminance image resolution	Single measurement: 1:4000
Dynamic resolution	HDR measurement (High-Dyn): 1:30 000 (1/1000 s < t_i < 8 s)

Configuration

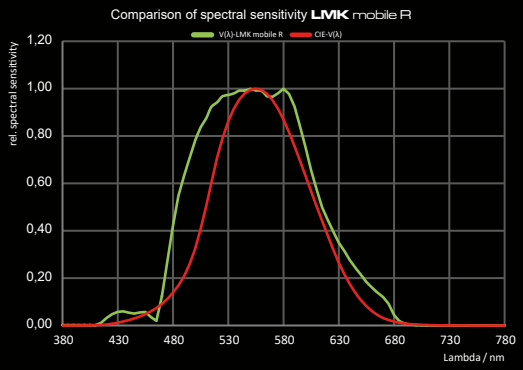
Selection of measuring range	Selecting aperture value, exposure time and ISO speed
Measuring distance	> approx. 280 mm
Foucs	Automatic focus/manual focus
Aperture values	F4 - F11 calibrated in 1/3 steps
Focal length	35 mm (fixed focal length); 24 - 70 mm (zoom); 7.5 mm (fisheye)
Viewing angle	57° (H) x 38° (V); 84° - 34° (diagonal); 180° (H) x 140° (V)
Exposure time	30 s - 1/1000 s

Properties

Light sensivity (typical full scale)

Aperture	4	4	11
ISO	100	1600	100
t_i= 0.001 s	12 kcd/m²	750 cd/m²	90 kd/m²
t_i= 3.0 s	4 cd/m²	0.2 cd/m²	30 cd/m²

V(λ)-matching: numerical matrixing from R, G, B sensor data



Integral spectral matching error in % for lamp types/spectra

Halogen metal discharge lamps	2-9%
High pressure sodium discharge lamps	7-13%
Fluorescent lamps	8-10%
LED white	5-12%

Calibration uncertainty ΔL in %	ΔL = 2.5 % (standard illuminant A)
Repeatability ΔL in %	ΔL = 0.05 … 0.85 %
Focus precision ΔL in %	ΔL ± 2.1 % (f_{22} ≤ 4.2 %)
Uniformity ΔL in %	ΔL = 2.5 %

Measuring uncertainty ΔL in % (for standard illuminant A)

Ti\Av	4	5.6	8	11
>250 ms	5.6	5.7	5.7	5.7

Typical relative standard deviation as a result of aperture stability for exposure times > 1/400 s

Operating data

Storage medium	SDHC memory card max. 258 GB (approx. 25 MP per image)
Operating system	Windows 10/11
Measuring software	**LMK** LabSoft (Luminance analysis software)

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