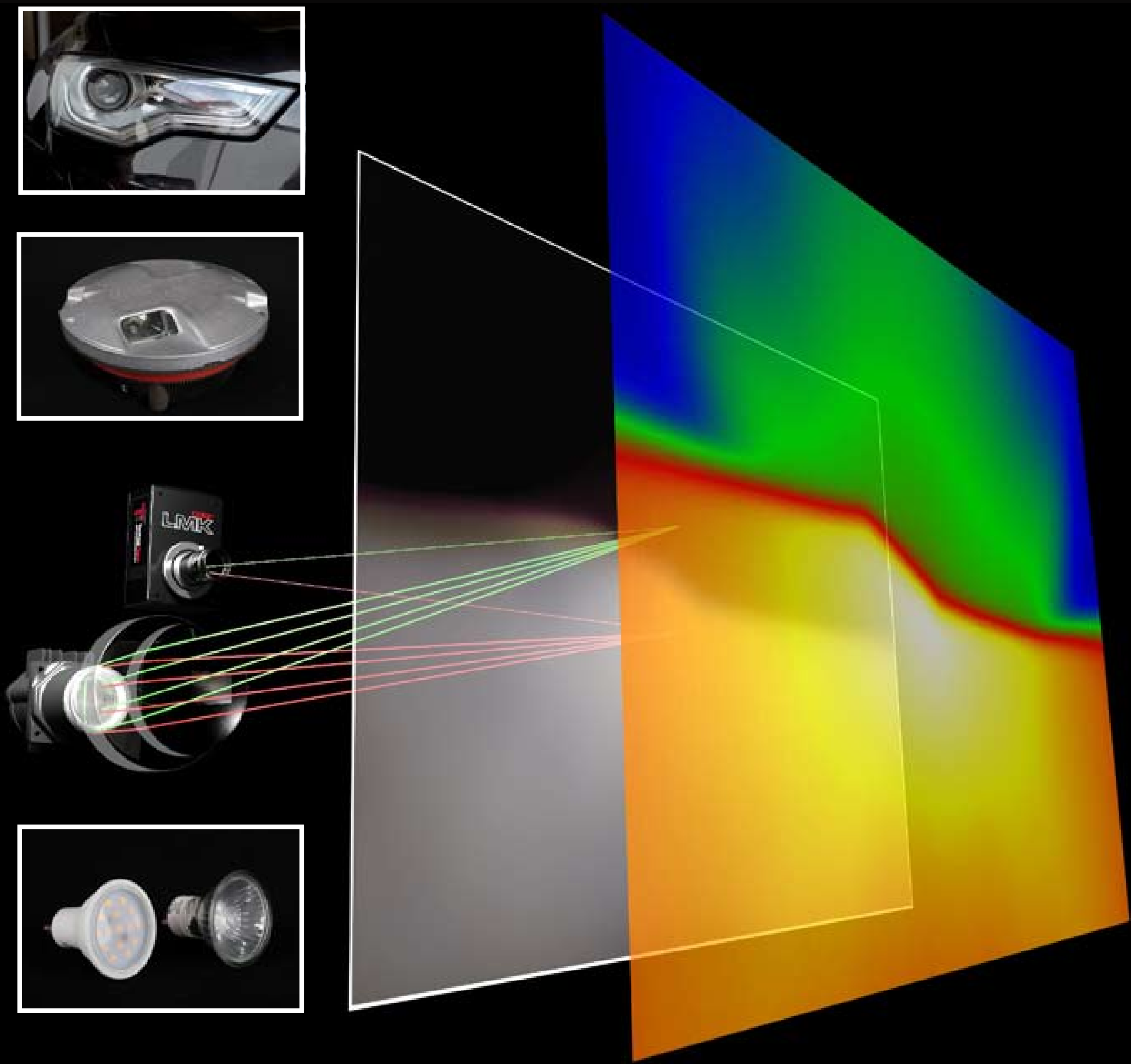
TechnoTeam
Bildverarbeitung GmbH



LID CHECKER

R&D and production accompanying measuring technique for luminous intensity distribution analysis

KMP

LID Checker and KMP

The spatially resolved measurement of luminous intensity distributions by means of the indirect light measurement technique allows the complex evaluation of numerous lighting-engineering devices:

- headlamps and rear lamps
- LED modules
- airfield lighting
- reflector lamps

The imaging luminance measuring technology provides the acquisition of both photometric and geometrical data, thus allowing the user to determine important lighting-engineering quantities:

- luminance distribution L(x,y) on an illuminated surface
- derived parameters such as luminous intensity distribution I(ϑ,ϕ) and the illuminance distribution E(x,y) on an illuminated surface
- color distribution on an illuminated surface getting the chromaticity coordinates x,y
- contrast
- chromatic fringe
- position and luminous intensity values of predefined measurement regions

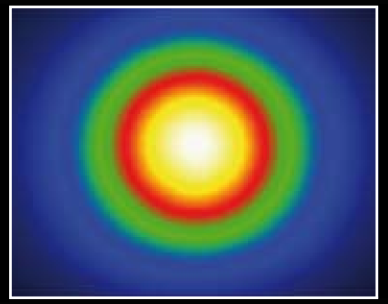
All this information can be determined by using our imaging photometer LMK or imaging colorimeter LMK color within seconds. In addition the integrated software solution LID Checker provides automated image processing routines for customer related measuring tasks. Significant geometrical and photometrical values are automatically analysed and an overall test result is provided.

KMP

Reflector lamps

Lamp No.	Voltage U[V]	Current I[A]	Power P[W]	Axial luminous intensity I[cd]	Max luminous intensity I[cd]	Tilt angle horiz. [°]	Tilt angle vert. [°]	Half value angle left [°]	Half value anlge right [°]	Sum HVA horiz. [°]	Half value angle up [°]	Half value angle down [°]	Sum HVA vert. [°]
Mean	**5.91**	**6.60**	**38.97**	**11778.0**	**12080.0**	**-0.40**	**0,30**	**-4.35**	**4.40**	**8.75**	**-4.20**	**4.15**	**8.30**
StdDev.	**0.02**	**0.00**	**0.13**	**674.6**	**356.4**	**0.42**	**0,00**	**0.07**	**0.14**	**0.21**	**0.00**	**0.07**	**0.00**
1	5.89	6.60	38.88	12255	12332	-0.1	0,3	-4.3	4.3	8.6	-4.2	4.1	8.3
2	5.92	6.60	39.06	11301	11828	-0.7	0,3	-4.4	4.5	8.9	-4.2	4.2	8.3

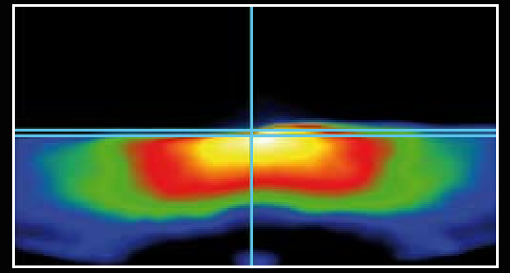
In the case of reflector lamps using the LMK within the KMP including the LID Checker Software provides notable speed advantages, so that it can even be used during the production process.



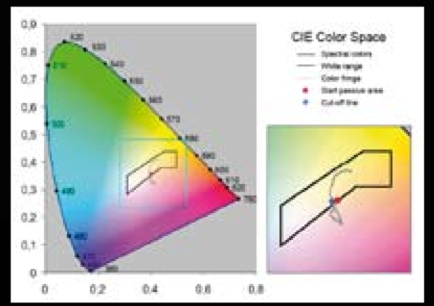
Headlamps

	x[°]	y[°]	Result	Luminous Flux
Elbow Point	-0.42	0.05	pass!	378 lm

Measuring				Set Val. [cd]		
No.	Position	X[°]	Y[°]	Min.	Max.	I [cd]
1	HV	0	0		500	496
2	B50L	-3.43	0.57		250	244
3	75R	1.15	-0.57	15000		19392

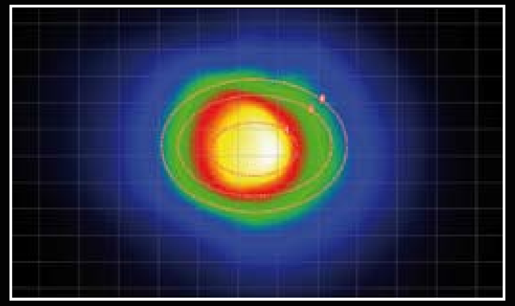


The KMP reduces the photometric distance significantly. Consequently, measuring headlamp modules (<120 mm) with the LMK or LMK color is fast and even possible in narrow spaces. LID Checker offers wide possibilities to define test specification in accordance to ECE, SAE and more.



Using the LID Checker with the LMK color offers more possibilities in the range of chromatic measurement. For example, analysing the chromatic values along a cross section is the basis for detailed cut-off line analysis.

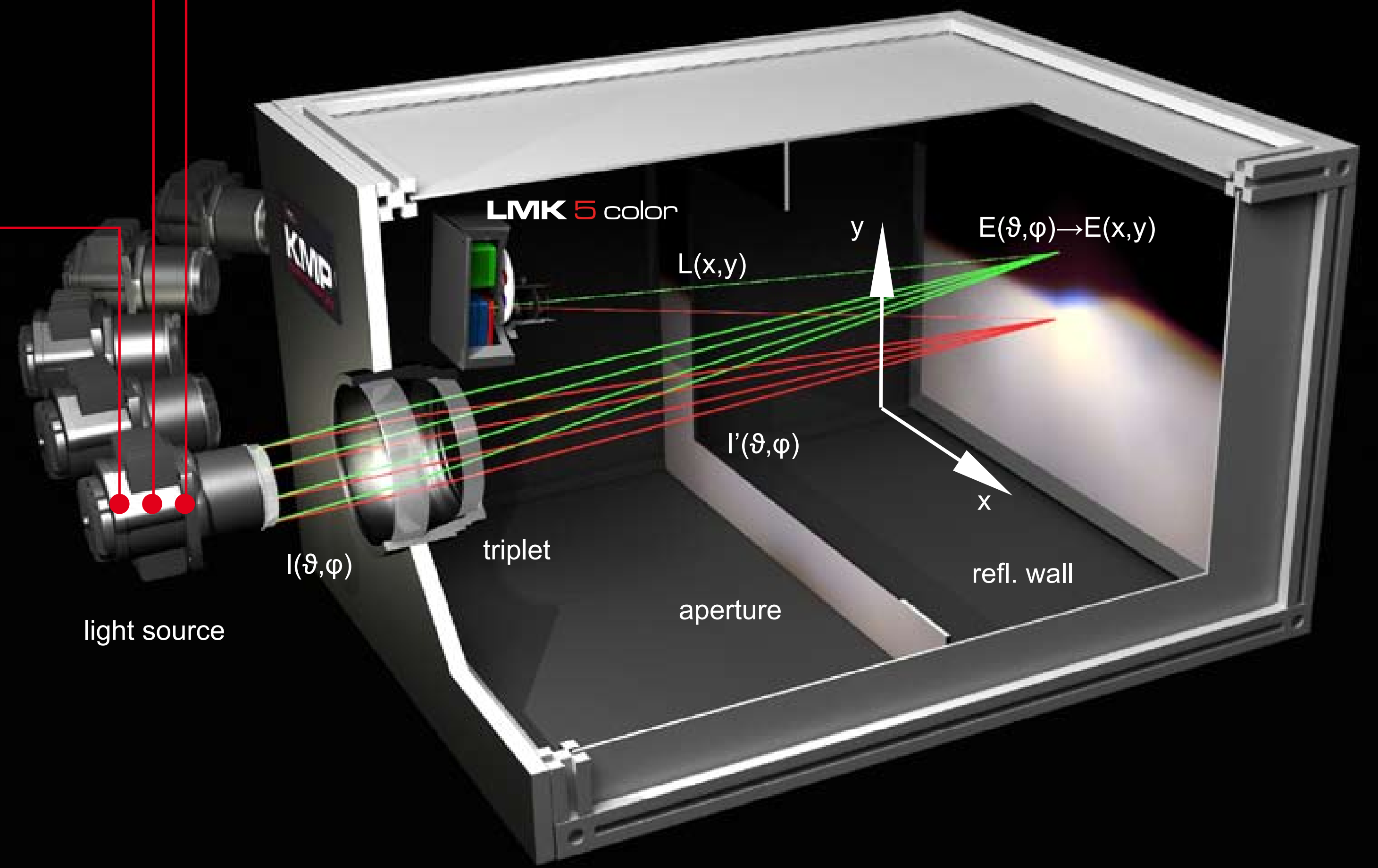
Airfield lighting



Parameters				Tolerances	
Region	Typ	Center x [°]	Center y [°]	Minimum	Average
1	Ellipse	-2	1	200	400
2	Ellipse	-2	1	200	
3	Ellipse	-2	1	400	

Results		Result:	pass!
Minimum	Minimum relativ	Average	Average relativ
230	1.15	486	1.215
287	1.435	568	
507	1.26	728	

Defining diverse geometrical regions is a valuable feature for analysing photometrical data in area of interest. In the case of airfield lighting, ellipse parameters can be passed automatically to test the measuring object.



Measuring Principle

The KMP is realization of the principle of the indirect luminous intensity measurement. A measuring object positioned in front of the optical system of the KMP illuminates a reflective wall with lambertian characteristics, which is placed in the focal plane of the optical system. Thus the reflected luminance distribution or color distribution can be measured by using the LMK or LMK color, which is mounted inside the KMP facing the reflective wall. The optical system of the KMP reduces the measuring distance to less than 1 m while maintaining the observance of the photometrical limiting distance. The geometrical and photometric relations between the light source (in spherical coordinates) and the reflective wall (in camera coordinates) are known, so that the luminous intensity distribution I(ϑ, ϕ) can be calculated automatically from the image of the luminance L(x, y).

The KMP is usually used as a stand-alone measuring station. However, due to its compact construction it can also be integrated in industrial manufacturing equipment.

Technical Data

Geometrical dimension
980 mm x 850 mm x 650 mm

Size of the measurement object
< 120 mm
(max. diameter of the light emitting surface)

Camera sensor
CCD Sony ICX 285 AL (2/3"); effective Pixel ca. 1380 (H) x 1030 (V); 14 Bit digital

Interface
Gigabit Ethernet Interface (GigE ®)

Spectral missmatch
V(λ) [f1' < 3.5%]; X(λ) [f1* < 4%]
Z(λ) [f1* < 6%]; V'(λ) [f1* < 6%]

Measuring range
Adaptable by using different integration/exposure times
100 µs - 15 s → ca. 3 Mcd – 20 cd
Higher intensities can be measured using optional grey filters

Angular resolution
up to 0.01°

Image field
±24° horizontal; ±15° vertical

Calibration uncertainty
Focusable lens ΔL [< 2.5%]

Repeatability
ΔI [< 0.1%]; Δx,y [< 0.0001]

Measuring accuracy
ΔI [< 3%]; Δx,y [< 0.0020]

Uniformity
ΔI [< 3%]

Measurable contrast
Common 1:1000 with measurement conditions according to CIE TC2-59 Draft characteristic f25

Measurement period
< 1 min for a full field luminance intensity distribution (e.g. ±24°; ±15°; 0.01°)

KMP

Software client

LID Checker

TechnoTeam provides an interactive user interface for applying test specifications in automated measurements. It is possible to define various measurement regions including their tolerance values. In the case of headlamp measurements, algorithms for automated elbow point detection and ReAim are included. In addition, the resulting measurement values can be summarized in individual protocols. The **LID** Checker also supports the TCP/IP interface for the communication with a process control system for fully automatic measurements.

Teach-In

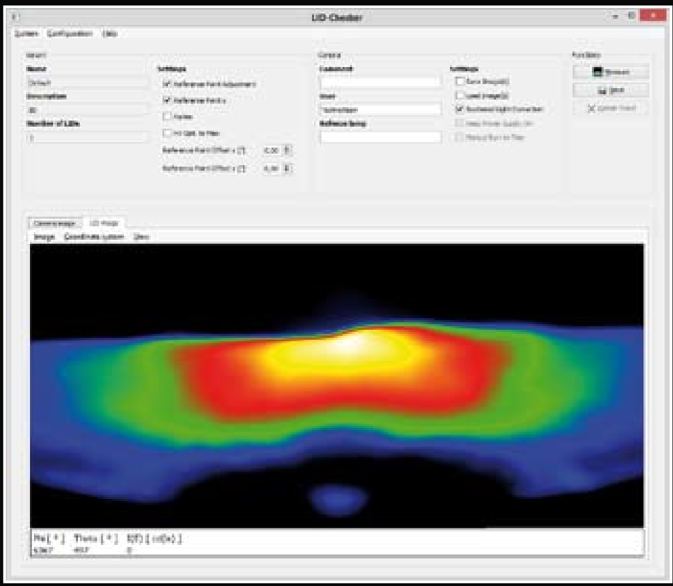
For the evaluation of lighting-engineering devices, it is often a point of interest to carry out more than just one single measurement task. For this purpose **LID** Checker includes a Teach-In interface to create different so called variants for each measurement task. Among other things it is possible to define variable rectangular regions e.g. concerning car headlamp measurements for searching Emax according to SAE or ECE regularities. All teached-in variants can easily be selected in the user interface of the **LID** Checker and run automatically.

Elbow Point Detection & ReAim

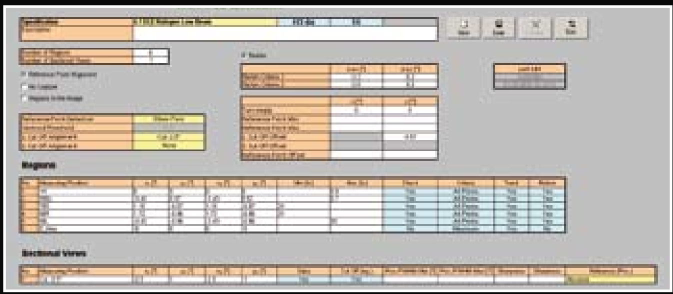
For measuring car headlamp LIDs, the **LID** Checker features the elbow point detection, based on the measured luminous intensity distribution data. This allows an automated adjustment of the predefined measurement regions to a reference point. In addition it is possible for all measuring tasks, to define a ReAim range to optimize the reference point, so that all measurement regions fulfil the official requirements.

Protocol design

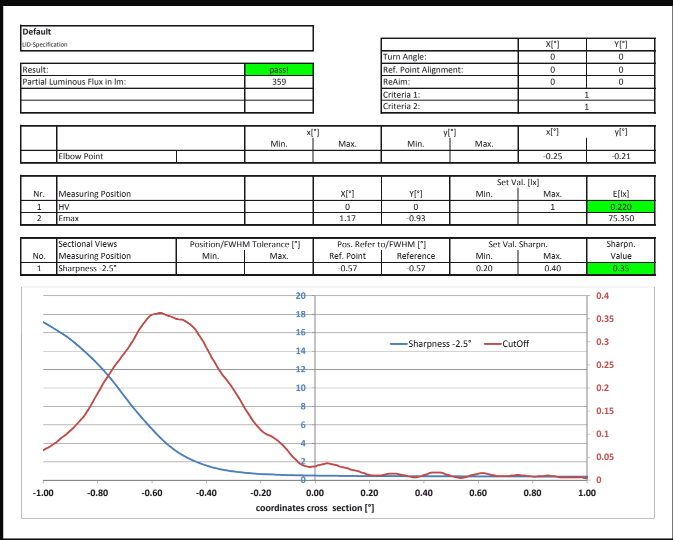
All results of selected variants are summarized in a tabular protocol. This enables the user to evaluate the measurement values fast and neatly. Beside the current measured values, selected values of past measurements are stored to create comprehensible trend data. Additional colored formatting or diagrams can further enhance the result overview.



LID Checker



Teach-In LID specification



Protocol design

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