

TEST REPORT

Nr CR 0138

Report version v1.0

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Test Item Retroreflector, DM3200 and D7200

Measurement quantity Coefficient of retroreflection, R_a

Standard EN 12899 / CIE 054

Measurement date 12.6. and 15.6.2020

Date 15.6.2020

Signatures  

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SSL

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TEST ARTEFACT

The test artefact was retroreflective sheet of type DM3200 and D7200. It was glued onto the black metal plate.

TEST METHOD

The measurements were made on the optical measurement rail setup at the dark room of SSL Resource Ltd. The light source and observer detector (luminance camera) and test artefact were aligned onto the same plane using 2pcs of crossline alignment lasers. The observer angle α (angle between the light source and luminance camera) was set to 0.33° ($20'$). The circular aperture of light source and luminance camera was 0.1° . The test artefact was mounted on the 3-axis goniometer at the large distance from the light source and luminance camera. The light source was 100W halogen lamp whose correlated color temperature was adjusted to standard illuminant A ($CCT = 2856K \pm 20K$) with the spectrometer. The illuminance E_v coming onto the perpendicular surface at the location of the test artefact was measured with the photometer. The reflected luminance L_v was measured by the luminance camera as an average over the image area that is corresponding to the 0.1° viewing angle. The coefficient of retroreflection was determined by $R_A = L_v / E_v$.

TRACEABILITY

The photometer's measuring head (sn. LH200-003) and the luminance meter (Camera acA 1920-40um, lens Tamron M112-FM35, $V(\lambda)$ -filter 19098) are traceable to national standard of illuminance responsivity at PTB (Reference's Certificate of calibration 200211, internal calibration CR-0112). The transimpedance amplifier of the photometer (L-200, sn L200-004) is traceable to national standard of electrical parameters at NIST (Reference's Certificate of calibration 2002191407E, internal calibration CR-0134). The spectrometer (SM240-SVOP-5221) is traceable to national standard of spectral irradiance at NIST (Certificate of calibration 105105-2F005624-K01). The expanded uncertainty of the coefficient of retroreflection is $\pm 15\%$.

MEASUREMENTS

The calibration was carried out on 12.6.2020 and 15.6.2020. at the optical rail of SSL Resource under conditions as stated in table 1.

The retroreflected luminance was measured at two β_1 angles. The measurement was repeated $\pm \beta_1$ angles to see if the sample is not symmetric. The illuminance reading was measured before and after luminance measurement. The illuminance E_v was measured to be 2.76 lx.

Table 1. Measurement conditions.

Parameter	Value
Ambient temperature of the laboratory	$(24.2 \pm 1)^\circ\text{C}$
Measurement distance	$(13890 \pm 10) \text{ mm}$
AC input voltage	239.0 V
Correlated color temperature	2857 K
Stabilization time of the light source	10 min
Uniformity of illumination at test artefact	0.8%
incidence angle of test artefact at observation half-plane (including illumination and retreoreflector axis), β_1	$5^\circ, 30^\circ$
incidence angle of test artefact plane perpendicular to the observation half-plane, β_2	0°

RESULTS

The test results are shown in tables 2. The R_A was calculated as an average of L_V at + and -directions.

Table 2. Result table – DM3200.

β_1	L_V (cd/m ²) + direction, -direction	R_A (cd m ⁻² lx ⁻¹)
5°	110.8, 112.6	35.6
30°	55.4, 58.08	18.1

Table 3. Result table – D7200.

β_1	L_V (cd/m ²)	R_A (cd m ⁻² lx ⁻¹)	R class	R1 limit	R2 limit
5°	214.7, 215.5	78.2	R1	50	180
30°	162.5, 166.7	59.8		24	100