

# TEST LABORATORY



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The test laboratory is accredited in compliance with DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH. The accreditation is also valid for products of Regulation EU 2016/425. Test methods not included in the scope of accreditation are marked by a \*.



Authorized for the testing of heat and flame-resistant protective clothing for car racers according to FIA 8856-2000 standard by the Fédération Internationale de l'Automobile (FIA) Paris.

## TEST REPORT

**Order number STFI:** 20190331.1

**Report date:** 25 February 2019  
**Person responsible:** Reinhardt

**Orderer:** Vescom B.V.  
Sint Jozefstraat 20  
5753 AV Deurne  
NETHERLAND

**Test order:**

**Date:** 4 February 2019  
**Order received:** 8 February 2019  
**Material received:** 8 February 2019



### Material to analyse:

3 samples sun protective material

signed by client	colour	code for order processing
KORO 8068	0008	P0331_19_4
KORO 8068	0010	P0331_19_5
KORO 8068	0011	P0331_19_6

The sampling was supplied by the client. The test department is not informed about the sampling procedure.

### Analysis content:

- (1) Remission and transmission in the visible light range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)
- (2) Remission and transmission in the global radiation range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)
- (3)\* Calculation of the total energy permeability degree  $g_{tot}$  of a window system with sun protective material, following DIN EN ISO 52022-1: 2018-01 and approximate calculation of the reduce factor  $F_c$  following DIN EN 14501: 2006-02
- (4)\* Calculation of the total energy permeability degree  $g_{tot}$  and the direct solar transmittance  $\tau_{e,tot}$  of a window system with sun protective material, following DIN EN ISO 52022-1: 2018-01 and approximate calculation of the reduce factor  $F_c$  and the secondary heat transfer factor  $q_{i,tot}$  following DIN EN 14501: 2006-02 (only for reference glazing C of DIN EN 14501: 2006-02)
- (5) Direct und diffuse transmission measurement in the visible light range in accordance with DIN EN 410: 2011-04 (DIN EN 14500: 2008-08)
- (6)\* Classification of glare control in accordance with DIN EN 14501: 2006-02 (p.15; paragraph 6.3; table 8)
- (7)\* Classification of privacy night in accordance with DIN EN 14501: 2006-02 (p.16; paragraph 6.4; table 9)
- (8)\* Classification of the visual contact with the outside in accordance with DIN EN 14501: 2006-02 (p.17; paragraph 6.5; table 10)
- (9)\* Classification of the daylight utilisation in accordance with DIN EN 14501: 2006-02 (p.18; paragraph 6.6; table 11) on the basis of the rotational symmetric diffuse/hemispherical light transmission degree  $\tau_{v,dif-h}$ , approximately calculated after equation 18 in DIN EN 14500: 2008-08
- (10) Measurement of the protective properties against ultraviolet solar radiation in accordance with DIN EN 13758 -1: 2007-03

\* Standards for calculation and assessment are not allowed for accreditation



### Conditions and equipment for optical tests:

test parameter	symbol	range of radiation
light transmission degree	$\tau_{v,n-h}$	380...780 nm (standard light D65)
light remission degree	$\rho_{v,n-h}$	380...780 nm (standard light D65)
light absorption coefficient	$\alpha_v$	380...780 nm
UV - transmission degree	$\tau_{uv}$	280...380 nm (UV-radiation)
solar transmission degree	$\tau_{e,n-h}$	280...2500 nm (global radiation)
solar remission degree	$\rho_{e,n-h}$	280...2500 nm (global radiation)
solar absorption coefficient	$\alpha_e$	280...2500 nm
normal/normal light transmission degree	$\tau_{v,n-n}$	380...780 nm (standard light D65)
normal/diffuse light transmission degree	$\tau_{v,n-dif}$	380...780 nm (standard light D65)

Equipment: UV/Visible/NIR spectrophotometer Lambda 900, PERKIN - ELMER Corp., USA; 150 mm integrating sphere; irradiation perpendicular to the integrating sphere opening; 8° slope of the sample area to the light incidence axis for remission measurements

For each material sample of the client three samples in the format (55 x 75) mm are taken, one in the machine direction, one in the cross machine direction and one diagonally. The irradiation takes place, if not otherwise noted, on the material side which is faced to the window system (marked by the client). During the measurement an circular area with a diameter of 25 mm (integrating sphere port) is covered by the sample.

### Description of classification for visual comfort:

Description of classification for glare control, privacy night, visual contact with the outside and the daylight utilisation is given in DIN EN 14501: 2006-02 (p.13; paragraph 6.1 table 5).

Influence on visual comfort					
class	0	1	2	3	4
	very small effect	small effect	moderate effect	high effect	very high effect

### Conditions for UV - transmission tests:

Equipment: Labsphere Ultraviolet Transmittance Analyzer UV-2000F

The samples were tested under normal climate conditions (20°C, 65% r. H.) without elongation.

The UV-transmission was measured in a wavelength range from (280 – 400) nm, whereas the UV-A range extends from (315 – 400) nm and the UV-B range from (280 – 315) nm. The solar spectrum of Albuquerque was used to calculate the UPF-rating.

**Test results:****(1) Light range****UV-range**

Code	light transmission degree	light remission degree	light absorption coefficient	UV-transmission degree
P0331_19	$\tau_{v,n-h}$	$\rho_{v,n-h}$	$\alpha_v$	$\tau_{UV}$
4	0,0090	0,6727	0,3183	0,0000
5	0,0070	0,6667	0,3263	0,0000
6	0,0033	0,6720	0,3247	0,0000

**(2) Global radiation range**

Code	solar transmission degree	solar remission degree	solar absorption coefficient
P0331_19	$\tau_{e,n-h}$	$\rho_{e,n-h}$	$\alpha_e$
4	0,0130	0,6170	0,3700
5	0,0123	0,6110	0,3767
6	0,0097	0,6160	0,3743

**(3)\* Total energy permeability degree  $g_{tot}$  and reduce factor  $F_c$** 

	Single glazing		Double glazing with air interspace		Double glazing with low emission degree and argon interspace		Triple glazing with low emission degree and argon interspace	
Code	$U_g=5,8 \text{ W/(m}^2\text{K)}$ $g=0,85$		$U_g=2,9 \text{ W/(m}^2\text{K)}$ $g=0,76$		$U_g=1,2 \text{ W/(m}^2\text{K)}$ $g=0,59$		$U_g=0,8 \text{ W/(m}^2\text{K)}$ $g=0,55$	
P0331_19	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$	$g_{tot}$	$F_c$
4	0,35	0,42	0,38	0,50	0,37	0,62	0,36	0,65
5	0,36	0,42	0,38	0,50	0,37	0,63	0,36	0,65
6	0,35	0,42	0,38	0,50	0,37	0,62	0,36	0,65

Code	Reference glass - DIN EN 13363-1: 2007-09			
	Triple glazing $U_g=2,0 \text{ W/(m}^2\text{K)}$ $g=0,65$		Double glazing with thermal protective covering $U_g=1,6 \text{ W/(m}^2\text{K)}$ $g=0,70$	
P0331_19	$g_t$	$F_c$	$g_t$	$F_c$
4	0,37	0,58	0,38	0,55
5	0,38	0,58	0,39	0,55
6	0,37	0,58	0,38	0,55



**(4)\* Total energy permeability degree  $g_{tot}$ , direct solar transmittance  $\tau_{e,tot}$ , reduce factor  $F_c$  and secondary heat transfer factor  $q_{i,tot}$**

Double glazing with low emission degree (C)				
Code	$U_g=1,2 \text{ W/(m}^2\text{K)}$ $g=0,59$		$\tau_e=0,49$ $\rho'_e=0,27$	
	$g_{tot}$	$F_c$	$\tau_{e,tot}$	$q_{i,tot}$
P0331_19				
4	0,37	0,62	0,01	0,36
5	0,37	0,63	0,01	0,36
6	0,37	0,62	0,01	0,36

**Mounting assumptions:**

- sun protective material inside and closed
- aerated interspace to the glazing

The mathematical model in DIN EN ISO 52022-1: 2018-01 (simplified method) for calculation of  $g_{tot}$  and  $\tau_{e,tot}$  is appropriated to a coarse compare of sun protection materials. The model is only valid for the following boundary requirements:

- $0 \leq \tau_{e,n-h} \leq 0,5$
- $0,1 \leq \rho_{e,n-h} \leq 0,8$

If the above mentioned boundary requirements are not fulfilled, the calculation of  $F_c$  from  $g_{tot}$  and  $g$  and the calculation of  $q_{i,tot}$  from  $g_{tot}$  and  $\tau_{e,tot}$  is not guaranteed either. The calculation is recommended in accordance with DIN EN ISO 52022-3: 2018-01 (detailed calculation method). Therefore it is necessary to measure reflection to the not the radiation exposed side and thickness at least in addition to the data of this order. In case of known conditions to be used at a building it is unalterable.

**(5) Diffuse und normal transmission in the visible light range**

Code	normal/hemispherical light transmission degree	normal/diffuse light transmission degree	normal/normal light transmission degree
P0331_19	$\tau_{v,n-h}$	$\tau_{v,n-dif}$	$\tau_{v,n-n}$
4	0,0090	0,0090	0,0000
5	0,0070	0,0070	0,0000
6	0,0033	0,0030	0,0003

**(6-8)\* Classification**

Code	glare control	privacy night	sight contact with the outside
P0331_19			
4	4	4	0
5	4	4	0
6	3	2	2

**(9)\* Classification of the daylight utilisation**

Code	diffuse/hemispherical light transmission degree	daylight utilisation
P0331_19	$T_{v,dif-h}$	
4	0,0080	0
5	0,0062	0
6	0,0029	0

The results are mean values from three measurements; spectrograms are kept in the test department.

**(10) Solar UV protective properties**

Code STFI	UPF		Transmission (UV-A) in %		Transmission (UV-B) in %		UPF-Rating
	Mean	STD	Mean	STD	Mean	STD	
P0331_19							
4	1915,50	7,57	0,10	0,00	0,05	0,00	50+
5	1941,63	12,49	0,09	0,01	0,05	0,00	50+
6	1964,68	4,82	0,07	0,00	0,05	0,00	50+

The results are mean values from 10 measurements.

This UPF rating is for the fabric and does not address the amount of protection which is afforded by the design of the article. Manipulations involved in garment manufacture such as stretching and sewing may lower the UPF-value of the material.

The protection offered by this item may be lessened,

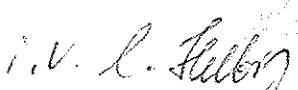
- at points where the fabric is in close contact with the skin such as across the shoulders
- if the fabric is stretched or wet
- with time, due to effects of normal wear



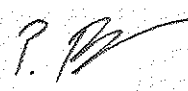
Unless otherwise agreed, all materials we received within this order will be kept for a maximum time of 6 month. Materials which are not stored because of technical or safety reasons are excluded from that

The testing period is defined as timeframe between receipt of samples and issue date of test report.

The test results are referring to the submitted samples. These test report is not allowed to copy in parts.

  
Dipl.-Ing. Marian Hierhammer  
head of test department



  
Patrick Reinhardt, M.Sc.  
field responsible collaborator

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## TEST REPORT

**Order number STFI:** 20191153.1

**Report date:** 31 May 2019  
**Person responsible:** Reinhardt

**Orderer:** Vescom B.V.  
Sint Jozefstraat 20  
5753 AV Deurne  
NETHERLAND

**Test order:**

**Date:** 3 May 2019  
**Order received:** 8 May 2019  
**Material received:** 8 May 2019





### Material to analyse:

3 sample fabric

signed by client	code for order processing
KORO Design : 806801	P1153_19_4
KORO Design : 806804	P1153_19_5
KORO Design : 806807	P1153_19_6

The sampling was supplied by the client. The test department is not informed about the sampling procedure.

### Analysis content:

- (1) Measurement and assessment of the dim out and black out effect in accordance to the STFI-internal test method PM 21 and classification in conformity with DIN EN 14501: 2006-02

### Test conditions:

Two circular test patterns with diameter of 30 cm were cut out of the sample. The equipment for measuring the "illuminance reduction" contains lamps, which generate illumination intensities of 0.1 Lux up to 1000 Lux (high power-LED) and 1000 Lux up to 100 000 Lux (arc torch) in the sample area. The IR-radiation range, which is not part of the sun light, is filtered out before reaching the sample. The exposure of the sample takes place with parallelized light.

The measuring area and assessment box are geometrically and dimensionally realized that the whole sample area is observed with an 10° observation angle.

Measured values are determined at the observer position by luxmeter, as an alternative for the subjective assessment in human dark seeing mode. Also an image, made by an artificial eye camera, is supposed in this measuring mode.

The assessment of the regulation of light transmission of textile fabrics is defined in 2 classes (DIN EN 14501: 2006-02; p.15, table 6):

Regulation of light transmission of fabrics	Classification of fabrics
No perception of light in testing with 1000 Lux	dim out
No perception of light in testing with 100 000 Lux	black out

**Test results:**

**Measurement and assessment at 1000 Lux illuminance:**

code	illumination with sample	darkening level	Visual observation	classification
P1153_19	Lux	%		
4	1,02	99,78	shining area with stars visible	no complete dim out
5	1,77	99,62	shining area with stars visible	no complete dim out
6	1,37	99,71	shining area with stars visible	no complete dim out

**Measurement and assessment at 100.000 Lux illuminance:**


code	illuminance with sample	darkening level	Visual observation	classification
P1153_19	Lux	%		
4	67,30	99,72	bright shining area with stars visible	no complete black out
5	119,25	99,51	bright shining area with stars visible	no complete black out
6	90,50	99,63	bright shining area with stars visible	no complete black out

The parameter "darkening level" is calculated from the measured illuminances with and without sample material and does not form a basis for the classification (dim out or black out). The classification is based on the subjective visual observation.


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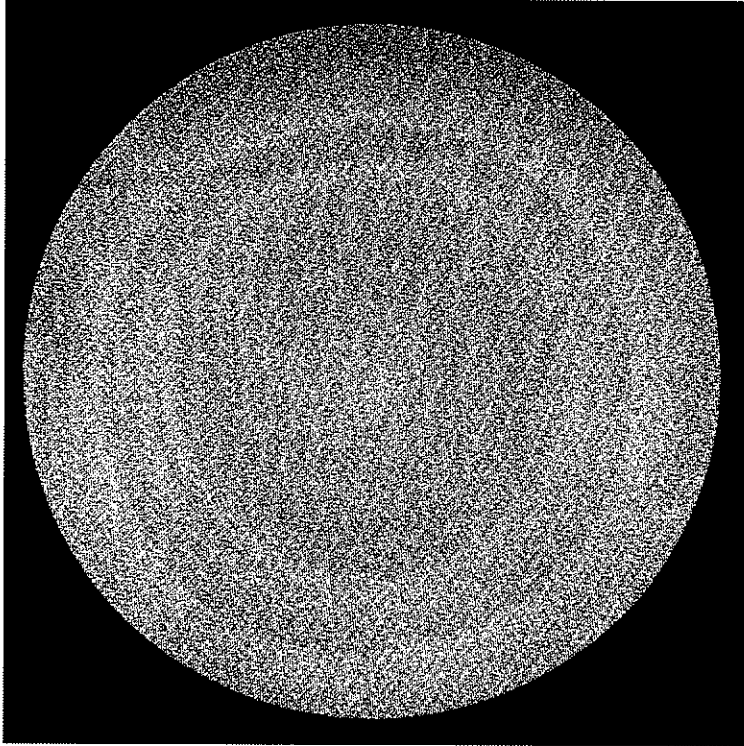
  
 Dipl.-Ing. Marian Hierhammer  
 head of test department



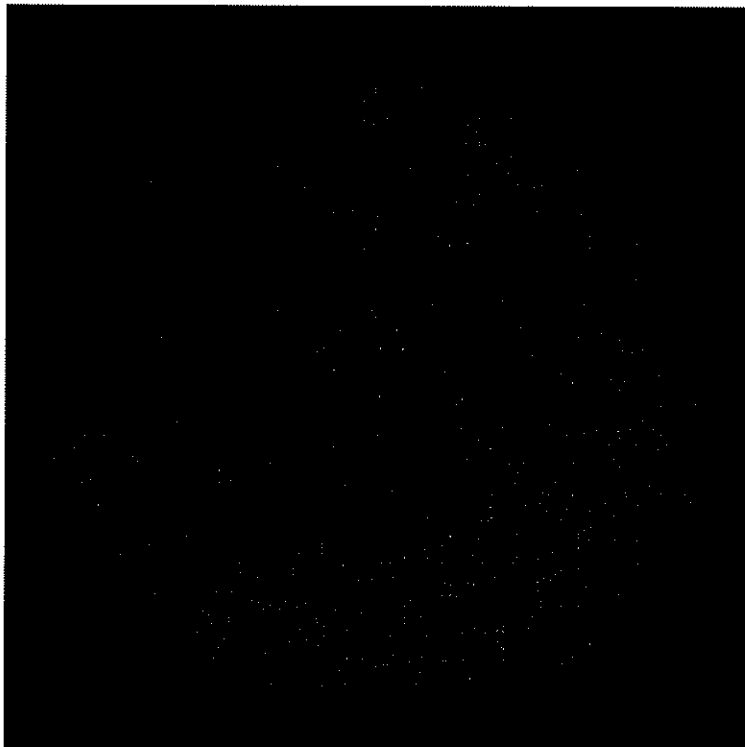
  
 Patrick Reinhardt, M.Sc.  
 field responsible collaborator



**Sample: Koro Design: 806801**



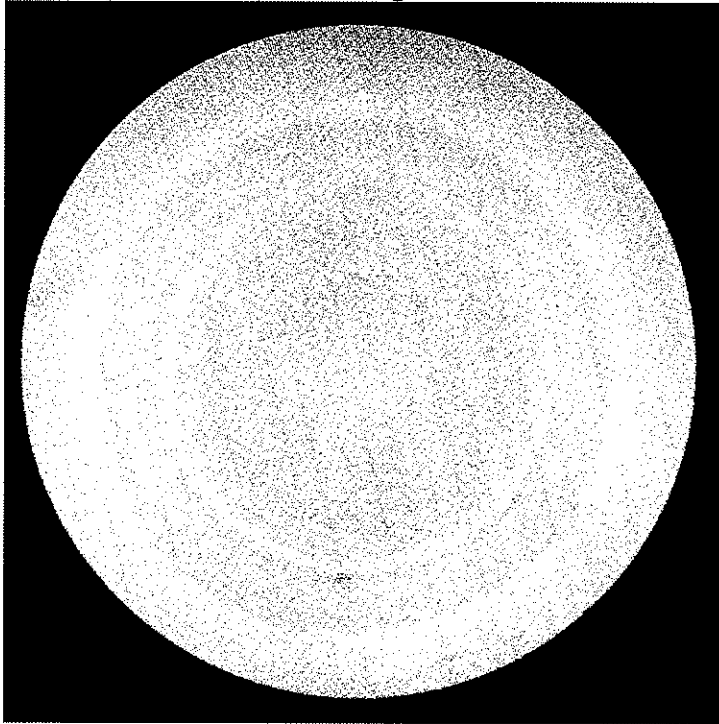
Illuminance 100 000 Lux



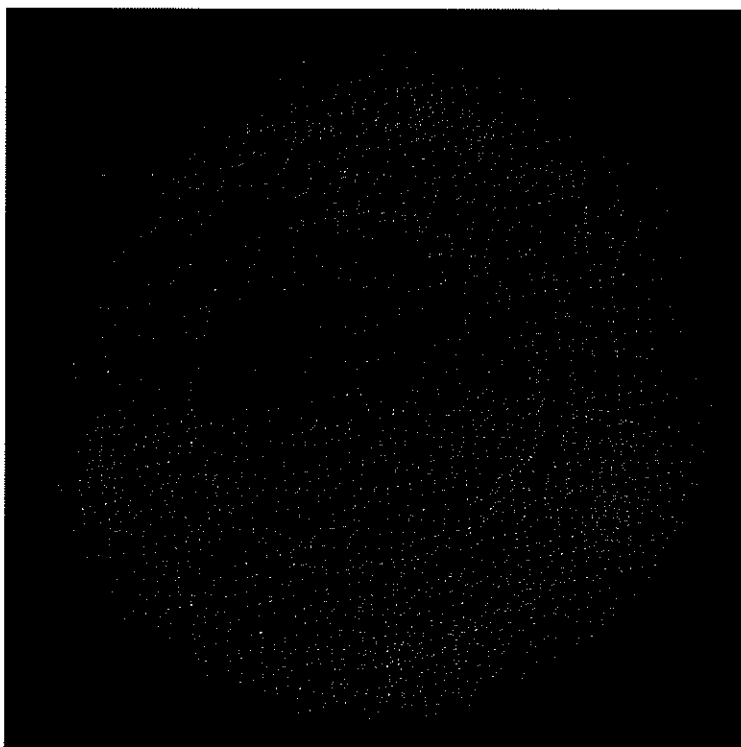
Illuminance 1000 Lux



**Sample: Koro Design: 806804**



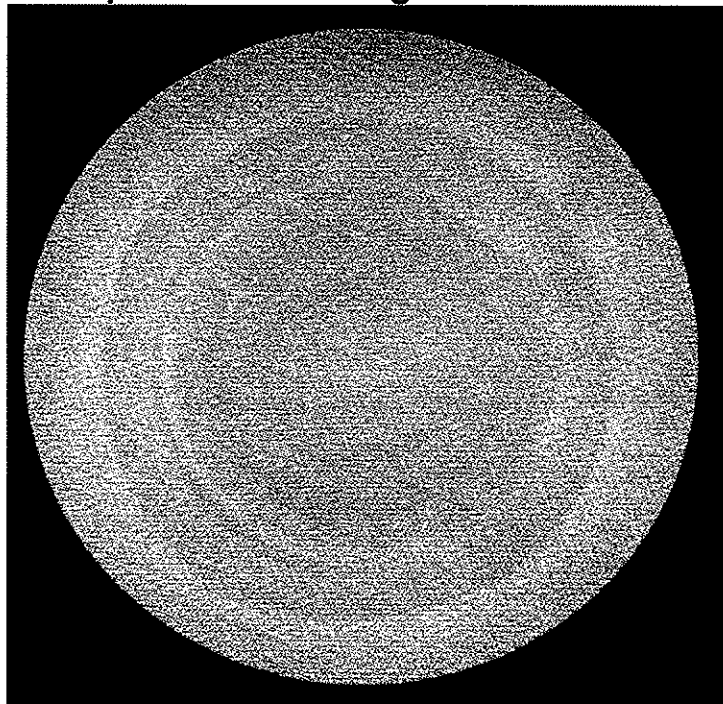
Illuminance 100 000 Lux



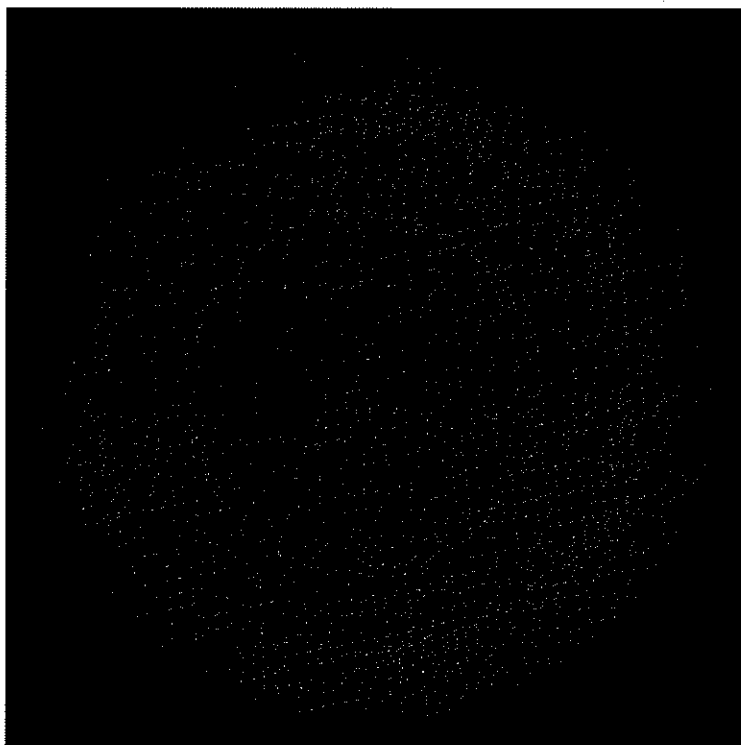
Illuminance 1000 Lux



**Sample: Koro Design: 806807**



Illuminance 100 000 Lux



Illuminance 1000 Lux