

# SLOVENSKI STANDARD SIST ISO 3664:1997

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Photography - Illumination conditions for viewing colour transparencies and their reproductions

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# iTeh STANDARD PREVIEW

Photographie -- Conditions d'éclairement pour l'examen visuel des diapositives en couleurs et de leurs reproductions

SIST ISO 3664:1997

Ta slovenski standard je istoveten z:422a5/\$50.3664:1975

# ICS:

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Photographic paper, films and cartridges

SIST ISO 3664:1997

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# iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>SIST ISO 3664:1997</u> https://standards.iteh.ai/catalog/standards/sist/d806e2d0-7253-4d30-a196d627d4e422a5/sist-iso-3664-1997



## INTERNATIONAL ORGANIZATION FOR STANDARDIZATION MEЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ ORGANISATION INTERNATIONALE DE NORMALISATION

# Photography – Illumination conditions for viewing colour transparencies and their reproductions

Photographie — Conditions d'éclairement pour l'examen visuel des diapositives en couleurs et de leurs reproductions

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Descriptors : photography, colour photography, film slides, prints, visual inspection, illuminance.

# SIST ISO 3664:1997

# FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3664 was drawn up by Technical Committee ISO/TC 42, *Photography*, and circulated to the Member Bodies in December 1974.

It has been approved by the Member Bodies of the following countries: SIST ISO 3664:1997

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Australia	https://standards	iteh.ai/catalog/standards/sist/d806e2d0-7253-4d30-a196-	
Austria	Ireland	d627d4e423witzeriand3664-1997	
Belgium	Italy	Turkey	
Bulgaria	Japan	United Kingdom	
Canada	Mexico	U.S.A.	
Czechoslovakia	Romania	Yugoslavia	
France	Spain		

No Member Body expressed disapproval of the document.

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# Photography – Illumination conditions for viewing colour transparencies and their reproductions

# **1 SCOPE AND FIELD OF APPLICATION**

This International Standard specifies the characteristics of

1) transparency illuminators (i.e. devices for uniformly and diffusely illuminating a transparency from behind so that it may be viewed directly) for use in viewing photographic colour transparencies under conditions of comparison with other reflection or transmission originals or reproductions;

2) transparency illuminators for use in direct viewing of photographic colour transparencies without reference to other originals or reproductions;

830 nm computed at 10 nm intervals as tabulated in the table on page 4. 3) illumination for use in viewing reflection colour RI The spectral power distribution of the transparency

illuminator surface is given here but no specification can be prints or reproductions when they are compared with set forth for the light source (or lamp) because photographic colour transparencies.

> a) the light from the source may be modified by the SIST ISO 3664:199 apparatus;

That circle corresponds to a variation in correlated colour

temperature of approximately 20 micro reciprocal degrees

(mireds). For simultaneous viewing on more than one transparency illuminator, there shall, ideally, be no percep-

The spectral power distribution of the transparency

illuminator surface shall, ideally, be the same as that of CIE Illuminant D<sub>50</sub> over a spectral range from 300 nm to

tible chromatic differences among the luminous surfaces.

3.2 Spectral power distribution

#### 2 REFERENCES https://standards.iteh.ai/catalog/standards/sist/d8 3-4d30-a196-

CIE Publication No. 13.2 [TC-3.2 (1974)], Method of measuring and specifying colour rendering properties of light sources.

CIE Publication No. 15 [E-1.3.1 (1971)], Colorimetry.

CIE Publication No. 17 [E-1.1 (1970)], International lighting vocabulary.

## **3 TRANSPARENCY ILLUMINATOR SPECIFICATIONS** FOR COMPARISON VIEWING

## 3.1 Chromaticity

The chromaticity of the illuminator surface shall be approximately that of CIE Illuminant D<sub>50</sub> representing a phase of natural daylight having a correlated colour temperature close to 5 000 K. The chromaticity coordinates of the illuminator surface shall lie on the locus of chromaticities corresponding to daylight illuminants at a co-ordinate position of x = 0.345 7, y = 0.358 6, in the CIE 1931 chromaticity diagram, or u = 0,2091, v = 0.325 4 in the CIE 1960 USC diagram. The tolerances for variation about this co-ordinate position shall be described by a circle having radius 0,008 in the CIE 1960 USC diagram or the corresponding approximate ellipse represented in the CIE 1931 chromaticity diagram.

ISO 5, Photography – Diffuse transmission density 422a5/sist-iso-36(b) 1 the required spectral power distribution may be obtained from a mixture of light from two or more different sources.

> Tolerances for acceptable variations in the spectral power distribution of the transparency illuminator surface are set forth below in terms of the CIE general colour rendering index.

#### 3.3 General colour rendering index

The CIE general colour rendering index of the transparency illuminator surface shall be measured as specified in CIE Publication No. 13.2 and shall have a value of 90 or higher. In addition, the separate special colour rendering indices for samples 1 to 8 shall each have a value of 80 or higher.

#### 3.4 Luminance

The average luminance of the illuminator surface shall be  $1270 \pm 320 \text{ cd} \cdot \text{m}^{-2}$  as measured with a luminance meter normal to the surface. The average luminance shall be determined as the quotient of the sum of nine measurements divided by nine. These nine measurements shall be made in the centre of each of nine distinct regions each having a height and width equal to 1/3 of the height and width of the illuminated surface. Luminance are to be obtained with meters either having a spectral response function identical with the values tabulated for spectral luminous efficiency function for the CIE standard photometric observer, as given in CIE Publication No. 17, page 51, table 1, or with a response calibrated in terms of integration with respect to that function with the light source under test. Any variations from complete uniformity of surface (viewing field) luminance shall be gradual and shall be such that the luminance in the centre of any one of the nine regions is not less than 75% of the maximum luminance measured in any other.

#### 3.5 Diffusion characteristics

The transparency illuminator surface shall provide diffuse light such that the luminance of the surface measured at any angle between 0 and  $45^{\circ}$  from normal shall not be less than 90 % of the luminance of the same area as measured normal (0°) to the surface.

#### 3.6 Borders

The transparency shall be illuminated from behind by diffuse light and shall be surrounded by an illuminated area at least 50 mm in width on at least three sides. The surround shall appear to be evenly illuminated and the average illumination shall not be less than one-half of the maximum in the viewing field. The purpose of the illuminated border is to influence the appearance of a transparency so as to facilitate comparison with a reflection print. When the transparencies or transparency being viewed occupy an area less than 70 mm by 70 mm, then the illuminated surround shall not be greater in extent than four times the area of the transparencies or transparency being viewed. Any illuminated area in excess of this shall be 11 covered with mid-grey opaque materiald Ad transparencyg/stan mounted with an opaque border may be viewed mounted if 22a5 the whole occupies an area less than 70 mm by 70 mm.

# 4 TRANSPARENCY ILLUMINATOR SPECIFICATIONS FOR DIRECT VIEWING

The specifications for illuminators intended for use in direct viewing of transparencies without reference or comparison with other reproductions shall be the same in all respects as 3.1 to 3.6 except that in 3.6 the border area shall have superimposed upon it a neutral density mask having diffuse transmission density of  $1,0\pm0,1$  as determined by the method given in ISO 5. The spectral transmittance and reflectance distribution of the mask shall be such that no change in chromaticity results beyond the chromaticity tolerance set forth in 3.1 and shall be chosen to be as spectrally non-selective as possible. This partially transparent border is preferred and specified rather than

a) the completely illuminated border of 3.6, because it is not desirable in direct viewing of transparencies to influence their appearance to facilitate comparison with reflection prints;

b) an opaque border since it is desirable to provide the observer with a fixed neutral reference, i.e. to permit the standard illuminator light flux to control visual adaptation rather than the variably chromatic flux transmitted by the transparency images.

# 5 ILLUMINATION SPECIFICATIONS FOR COMPARI-SON VIEWING OF REFLECTION PRINTS

## 5.1 Chromaticity

The chromaticity of the illumination incident upon the reflection sample shall be approximately that of CIE Illuminant  $D_{50}$  representing a phase of natural daylight having a correlated colour temperature close to 5 000 K. The chromaticity co-ordinates of such illumination shall lie on the locus of chromaticities corresponding to daylight illuminants at a co-ordinate position of x = 0.3457, y = 0.3586, in the CIE 1931 chromaticity diagram or u = 0.2091, v = 0.3254 in the CIE 1960 USC diagram. Tolerances for variation about this co-ordinate position shall be described by a circle having a radius of 0.008 in the CIE 1960 USC diagram or the corresponding approximate ellipse represented in the CIE 1931 chromaticity diagram.

There shall, ideally, be no perceptible chromatic difference between the luminous surface used to view transparencies and a white reference standard in place of a reflection sample. (See 6.1.)

# 5.2 Spectral power distribution

The spectral irradiance of the illumination shall, ideally, be the same as that of CIE Illuminant  $D_{50}$ , representing a phase of natural daylight having a correlated colour temperature close to 5 000 K, over the wavelength range of 360 nm to 830 nm computed at 10 nm intervals as tabulated in the table on page 4.

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When viewing reflecting materials containing fluorescent brighteners or fluorescent colourants, the relative spectral power of the illumination shall be the same as that of CIE Illuminant  $D_{50}$ , representing a phase of natural daylight having a correlated colour temperature close to 5 000 K, over the wavelength range of 300 nm to 830 nm computed at 10 nm intervals as tabulated in the table in order to provide ultra-violet power in the spectral region of 300 nm to 360 nm for stimulation of fluorescent materials.

The spectral power distribution of the illumination incident on the reflecting sample is given here but no specification can be set forth for the light source (or lamp) because

- a) the light from the source may be modified by the apparatus;
- b) the required spectral power distribution may be obtained from a mixture of light from two or more different sources.

Tolerances for acceptable variations in the spectral power distribution of the incident illumination are set forth below in terms of the CIE general colour rendering index.

# 5.3 General colour rendering index

The CIE general colour rendering index of the illumination shall be measured as specified in CIE Publication No. 13.2 and shall have a value of 90 or higher. In addition, the separate special colour rendering indices for samples 1 to 8 shall each have a value of 80 or higher.

## 5.4 Illumination

The illuminance at the print-viewing plane shall be  $2000 \pm 500$  lx as measured with a horizontally positioned, cosine-corrected, illumination photometer located at the centre of the viewing plane. Illuminance values are to be obtained with meters either having a spectral response function identical with the values tabulated for spectral luminous efficiency function for the CIE standard photometric observer, as given in CIE Publication No. 17, page 51, table 1, or with a response calibrated in terms of integration with respect to that function with the light source under test.

The aim illuminance shall be 2 000 lx. In any event the luminous flux density measured at the centre of the transparency illuminator viewing surface shall stand in a ratio of  $2: 1 \pm 0,2$  to the luminous flux density of the illumination measured at the centre of the viewing plane. (See 6.2.)

The illumination over the entire viewing plane shall be uniform. (See 6.3.) Further, the light shall be so incident and the reflection reproduction so positioned that the effects of specular reflection are minimized.

# **6 NOTES**

6.1 The ideal white reference standard is a Lambert reflector. In practice, materials such as smoked or pressed magnesium oxide, pressed barium sulphate powder, paint for photometric integrators, or a Munsell colour sample N 9/1 may be used.

6.2 It is noted that the luminance of a transparency illuminator expressed in cd·m<sup>-2</sup> (i.e. in lumens-metre<sup>-2</sup> steradian<sup>-1</sup>;  $\text{Im} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$ ) should be multiplied by  $\pi$  in order to compute the ratio of luminous flux densities when comparison is made with illuminance expressed in lux (i.e.  $Im \cdot m^{-2}$ ). Thus, for example:

$$\frac{(\pi \cdot \text{sr}) (1\ 270\ \text{Im} \cdot \text{m}^{-2} \cdot \text{sr}^{-1})}{2\ 000\ \text{Im} \cdot \text{m}^{-2}} = 1,994\ 9 \approx 2 \qquad \dots (1)$$

or,

$$\frac{1270 \text{ Im} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}}{(\pi \cdot \text{sr})^{-1} (2\ 000 \text{ Im} \cdot \text{m}^{-2})} = 1,994\ 9 \approx 2 \qquad \dots (2)$$

# 5.5 Environmental conditions Teh STANDARD PREVIEW

The environmental conditions shall be designed to produce a minimum of interference or influence upon the viewing S.1 conditions and care should be taken that none of the environmental conditions alters the state of signal 3664 hambert emitter, and the form of equation (2) assumes that

should be baffled so that they contribute essentially no light to the viewing plane and the front surface of the transparency illuminator, and are not visible to a person of average height in a position in which observations are to be made. The surfaces of environmental walls, ceilings, floors, etc., shall be baffled by an essentially neutral material in order not to reflect any undesirable quality light onto the samples.

since the total flux emitted per unit area of a Lambert surface equals  $\pi$  times the luminance. Hence, the form of equation (1) assumes that the illuminator surface is a adaptation of the observer. Environmental light sources, the illumination is incident upon a Lambert reflector.

6.3 The term "uniform" is used here to mean that the average level of illumination for viewing by reflection shall be of such a degree of uniformity that, if a uniform sheet of white paper of the maximum size of the original or reproduction is placed in the viewing position, it shall appear to be uniformly illuminated.

<sup>1)</sup> NEWHALL S. M., NICKERSON D., and JUDD D. B., Final report of the O.S.A. sub-committee on the spacing of the Munsell colors, Journal of the Optical Society of America, 33, 385-418 (1943).

Wavelength nm       Relative power         300       0,000 2         310       0,020         320       0,178         330       0,179         350       0,210         360       0,239         370       0,289         380       0,245         390       0,298         400       0,493         410       0,565         420       0,600         430       0,578         440       0,748         450       0,914         480       0,952         500       0,957         500       0,957         500       0,957         500       0,957         500       0,957         500       0,957         500       0,966         550       1,000         550       0,360         550       0,361         550       1,000         560       1,000         560       1,000         560       1,000         620       0,992 <tr< th=""><th colspan="4">Illuminant D<sub>50</sub></th></tr<>	Illuminant D <sub>50</sub>			
nm       0,000 2         310       0,000 2         320       0,078         330       0,148         340       0,179         350       0,210         360       0,239         370       0,269         380       0,245         390       0,288         400       0,443         410       0,566         420       0,600         430       0,578         440       0,748         450       0,872         460       0,906         470       0,914         480       0,952         490       0,920         500       0,966         520       7AND ARD 977         540       standa rds.itt 1,023         560       1,000         570       SIST 50 36(410)         580       haircatalogisti idards/sist/ 0,935         600       602         600       0,987         601       0,993         620       0,990         630       0,991         650	Wavelength	Relative power		
310     0,020       320     0,078       330     0,148       340     0,179       350     0,210       360     0,239       370     0,269       380     0,245       390     0,298       400     0,493       410     0,666       420     0,600       430     0,578       440     0,748       450     0,872       460     0,906       470     0,914       480     0,957       510     0,966       520     TAND       549     standards/sist/6,093       550     1,000       560     1,000       570     SIST 50 3664:19,0997       580     h.ai/catalog/sts hdards/sist/6,933       600     d627d4e422       600     0,988       650     0,997       660     0,983       620     0,993       620     0,993       620     0,993       620     0,993       620 </td <td></td> <td></td>				
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340       0,179         350       0,210         360       0,239         370       0,269         380       0,245         390       0,298         400       0,493         410       0,565         420       0,600         430       0,578         440       0,748         450       0,872         460       0,906         470       0,914         480       0,952         490       0,920         510       0,966         520       0,957         510       0,966         520       1,000         550       1,000         550       1,000         550       1,000         560       1,000         560       1,000         560       1,000         560       1,000         560       1,000         560       0,935         600       6627d4e422         5/sist-iso-3(0,977         610       0,993         620		· · ·		
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360     0,239       370     0,245       380     0,245       390     0,298       400     0,493       410     0,666       420     0,600       433     0,578       440     0,748       450     0,872       460     0,906       470     0,914       480     0,957       500     0,957       510     0,966       520     500     0,957       510     0,966     1,008       550     \$10     0,966       550     \$10     0,967       560     1,000     570       570     \$151 SO 3664:19 0,977       560     1,000       570     \$151 SO 3664:19 0,977       580     660     0,983       600     627d4e422:5/sist-iso 36 0,977       610     0,993     60-7253-4d3 0-a196       600     627d4e422:5/sist-iso 36 0,977       610     0,993     620       620     0,986     650       620     0,986 </td <td></td> <td></td>				
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390       0,298         400       0,493         410       0,665         420       0,600         430       0,578         440       0,748         450       0,872         460       0,906         470       0,914         480       0,952         490       0,920         500       0,957         510       0,966         520       7AND         540       standards.it 1,008         550       1,000         570       SIST ISO 3664:19 0,977         560       1,000         570       SIST ISO 3664:19 0,933         620       0,993         620       0,993         620       0,993         620       0,993         620       0,993         620       0,993         620       0,993         620       0,997         610       0,982         670       1,030         680       0,991         690       0,874         700       0,9				
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430     0,578       440     0,748       450     0,872       460     0,906       470     0,914       480     0,952       490     0,920       500     0,966       510     0,966       520     0,966       540     standards.it       550     1,000       570     SIST ISO 3664:19.977       560     1,000       570     SIST ISO 3664:19.977       580     ndards/sist/0.938       600     d627d4e422:       600     d627d4e422:       600     0,997       610     0,993       620     0,997       610     0,988       650     0,957       660     0,982       670     1,030       680     0,991       690     0,874       700     0,926       750     0,768       730     0,866       740     0,929       720     0,768       750     0,782       760 <td></td> <td></td>				
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$				
470     0,914       480     0,952       490     0,920       500     0,957       510     0,966       520     7       540     520       550     1,000       570     511       560     1,000       570     5151       560     1,000       570     5151       560     1,000       570     5151       560     1,000       570     5151       560     1,000       570     5151       560     1,000       570     5151       560     1,000       570     660       600     627d4e4222       5/sist-iso-36.97997       610     0,993       620     0,990       630     0,991       660     0,982       670     1,030       680     0,991       690     0,874       700     0,882       670     0,782       760     0,782<				
480     0,952       490     0,920       500     0,957       510     0,966       520     TAND       540     standards.it(,023)       550     1,000       570     SISTISO 3664:19,0;977       560     1,000       570     SISTISO 3664:19,0;977       560     1,000       570     SISTISO 3664:19,0;977       580     600       600     d627d4e422;5/sist-iso-36,977       610     0,993       620     0,990       630     0,9957       640     0,988       650     0,957       640     0,982       670     1,030       680     0,991       690     0,874       700     0,929       720     0,768       730     0,866       740     0,926       750     0,782       760     0,577       770     0,829       780     0,734       810     0,639       820     0,708 <td></td> <td></td>				
490       0,920         500       0,957         510       0,966         520       TAND       ARD       937         540       standards/sit/008       ai)       550         550       1,000       ai)       560         550       1,000       ai)       560         550       1,000       570       SISTISO 3664:190,977         560       1,000       570       SISTISO 3664:190,977         560       1,000       600       6627d4e4222,5/sist-iso-360,977         610       0,993       620       0,990         630       0,997       610       0,993         620       0,990       630       0,957         640       0,988       650       0,957         660       0,982       670       1,030         680       0,991       690       0,874         700       0,926       750       0,782         760       0,577       770       0,829         780       0,782       760       0,577         700       0,796       800 <td< td=""><td></td><td></td></td<>				
500       0,957         510       0,966         520 TAND ARD       97REVIEW         540 standards.it       1,023         550       1,000         550       1,000         560       1,000         560       1,000         560       1,000         560       1,000         560       1,000         570       SIST ISO 3664:190,977         580       100 3664:190,977         600       600       0,989         600       0,993         600       0,993         620       0,990         630       0,997         610       0,993         620       0,993         620       0,993         620       0,997         640       0,988         650       0,957         640       0,988         650       0,957         640       0,988         650       0,957         640       0,988         650       0,957         660       0,957         <				
510       0,966         iTeh       520       0,971       EVIE       W         540       standards.it       1,021       W         550       1,000       i       0,989         560       1,000       0,935       0-a196         570       SIST ISO 3664:190,9977       0-a196         580       ai/catalog/standards/sist/d       0,935       d0-7253-4d3       0-a196         600       d627d4e422:       5/sist-iso-36/977       610       0,993       620       0,990         630       0,957       640       0,988       650       0,957         640       0,988       650       0,957       660       0,982         670       1,030       680       0,991       690       0,874         700       0,916       710       0,929       720       0,768         730       0,866       0,577       770       0,829       780       0,783         780       0,783       790       0,796       800       0,734       810       0,639       820       0,708       820       0,708       820				
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540       standards.it       1.008       ai)         550       1,000       560       1,000         570       SIST ISO 3664:199,977       680       6989       20-7253-443       0-a196         600       d627d4e4222       5/sist-iso-36,935       0-a196       600       662       0,993       620       0,993       620       0-a196         600       d627d4e4222       5/sist-iso-36,977       610       0,993       620       0,993       630       0,914       630       630       637       630       637       630	iTah 520TAND	ARD PREVIEW		
550       1,023         560       1,000         570       SIST ISO 3664:199;977         600       0,989         600       0,935         600       0,993         600       0,993         620       0,993         620       0,993         630       0,957         640       0,988         650       0,957         660       0,982         670       1,030         680       0,991         690       0,874         700       0,916         710       0,929         720       0,768         730       0,866         740       0,926         750       0,782         760       0,577         770       0,829         780       0,783         790       0,734         810       0,639         820       0,708	<sup>540</sup> standa	rds it $1008$ ai)		
570       SIST I SO 3664:190,977         580       ai/catalog/stindards/sist/d 9382       d0-7253-4d3       0-a196         600       d627d4e422a       5/sist-iso-36(2-11997)       610       0,997         610       0,993       620       0,990       630       0,957         640       0,988       650       0,957       660       660       660         650       0,957       660       0,982       670       1,030       680       0,991       690       0,874         660       0,916       710       0,929       720       0,768       730       0,866       740       0,926       750       0,782       760       0,577       770       0,829       780       0,783       790       0,796       800       0,734       810       0,639       820       0,708       800       0,734       810       0,639       820       0,708       800       0,734       810       0,639       820       0,708       800       0,708       800       0,708       800       0,708       800       0,708       800       0,708       800       800	550			
580 				
600       627d4e422a       5/sist-iso-360,977         610       0,993         620       0,990         630       0,957         640       0,988         650       0,957         640       0,982         670       1,030         680       0,991         690       0,874         700       0,916         710       0,929         720       0,768         730       0,866         740       0,926         750       0,782         760       0,577         770       0,829         780       0,783         790       0,783         790       0,796         800       0,734         810       0,639         820       0,708	ttns://standards.teh.ai/catalog/sta	ndarda/gigt/d019892d0 7252 4d20 a106		
600       0,977         610       0,993         620       0,990         630       0,957         640       0,988         650       0,957         660       0,982         670       1,030         680       0,991         690       0,874         700       0,916         710       0,929         720       0,768         730       0,866         740       0,926         750       0,782         760       0,577         770       0,829         780       0,783         790       0,796         800       0,734         810       0,639         820       0,708	462744-4224	0,935		
6200,9906300,9576400,9886500,9576600,9826701,0306800,9916900,8747000,9167100,9297200,7687300,8667400,9267500,7827600,5777700,8297800,7837900,7968000,7348100,6398200,708	600 00270+0+228	0,977		
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7500,7827600,5777700,8297800,7837900,7968000,7348100,6398200,708				
760       0,577         770       0,829         780       0,783         790       0,796         800       0,734         810       0,639         820       0,708				
770     0,829       780     0,783       790     0,796       800     0,734       810     0,639       820     0,708				
780     0,783       790     0,796       800     0,734       810     0,639       820     0,708				
790       0,796         800       0,734         810       0,639         820       0,708				
800       0,734         810       0,639         820       0,708				
810 0,639 820 0,708				
820 0,708				
	830	0,744		

## TABLE – Relative spectral power of reference Illuminant D<sub>50</sub>