

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



**LED – Binning –
Part 1: General requirements and white grid**

Withhold Standard Preview

IEC/PAS 62707-1:2011
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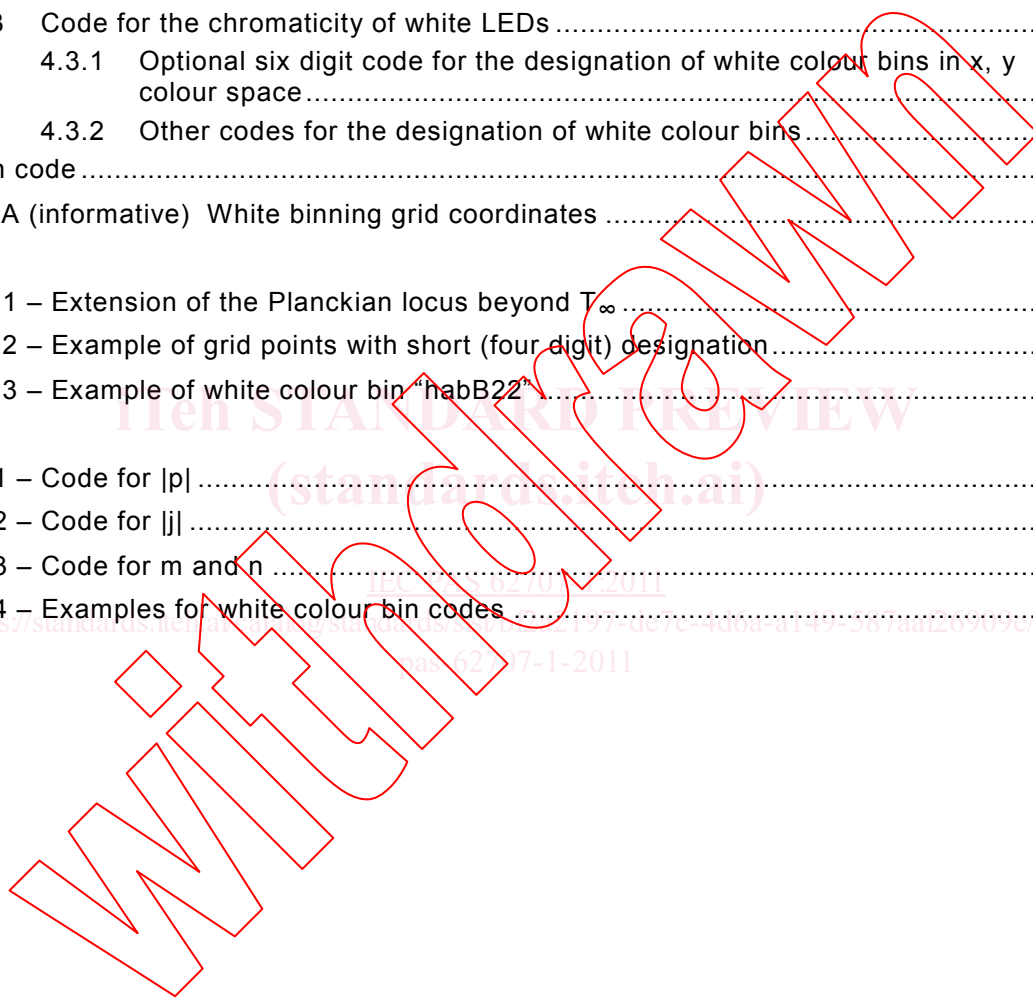
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ICS 29.140.99

ISBN 978-2-88912-402-2

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LED – BINNING –**Part 1: General requirements and white grid**

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IEC-PAS 62707-1 has been processed by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
34A/1429/PAS	34A/1448/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

A list of all the parts in the IEC 62707 series, published under the general title *LED – Binning* can be found on the IEC website.

A bilingual version of this publication may be issued at a later date.

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LED – BINNING –

Part 1: General requirements and white grid

1 Scope

This PAS specifies general requirements, a grid and a corresponding code for the colour binning of white LEDs emitting incoherent, visible radiation.

Other parts of this series covering chromaticity of coloured LEDs, luminous flux/luminous intensity, colour rendering and forward voltage are in preparation or under consideration.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC/TS 62504, ___ *General lighting – LEDs and LED modules – Terms and definitions*¹

ISO 11664-1 (CIE S 014-1/E), *Colorimetry – Part 1: CIE standard colorimetric observers*

ISO 11664-5 (CIE S 014-5/E), *Colorimetry – Part 5: CIE 1976 L*u*v* Colour space and u', v' uniform chromaticity scale diagram*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC/TS 62504 and the following apply.

3.1 bin

restricted range of LED performance characteristic used to delimit a subset of LEDs near a nominal LED performance as identified by chromaticity, photometric performance and forward voltage

(IEC/TS 62504: ___, 3.5)

3.2 grid

entity specified by a set of grid points

3.3 grid point

colour coordinate in the u', v' colour space according to ISO 11664-5 (CIE S 014-5/E) (or its equivalent in the x, y colour space according to ISO 11664-1 (CIE S 014-1/E)) identified by two discrete indices, the first index p counting steps along the Planckian locus, and its extension beyond the high temperature boundary towards blue colours, and second index j along Judd isothermal lines

¹ To be published

3.4

white colour bin

area inside a quadrilateral defined by four grid points

4 Chromaticity bins for white LEDs

4.1 Grid for white LEDs

The grid shall be aligned parallel along the Planckian locus, and its extension beyond the high temperature boundary towards blue colours, in the first direction (Planck-axis) and along Judd isothermal lines in the second direction (Judd-axis).

The origin of the grid shall be on the Planckian locus at T_{∞} (u'/v') = (0,18006/0,39528).

The distance between adjacent grid points along the Planckian locus and its extension beyond the high temperature boundary towards blue colours and along Judd isothermal lines in the u' , v' colour space shall be $s = 0,00174$. Steps along the Planckian locus are counted with a positive index p , steps toward blue with a negative index p . Steps towards the saturated colour line (gamut) along the Judd-axis are counted with a positive index j and with negative index j in the opposite direction.

NOTE 1 $s = 0,00174$ has been chosen as providing for the best alignment with existing chromaticity requirements.

The extension of the Planckian locus beyond T_{∞} (towards blue) shall be defined as follows (see Figure 1 for information):

- Quadratic Bézier locus defined by three points:
 - P_1 : T_{∞} (u'/v') = (0,18006/0,39528)
 - P_2 : (u'/v') = (0,14122/0,15593)
 - P_3 : (u'/v') = (0,25680/0,01659)
- The Bézier locus is $B(t) = P_1 \times (1-t)^2 + P_2 \times t \times (1-t) + P_3 \times t^2$; $t \in (0;1)$

NOTE 2 P_2 is the intersection of spectral locus of the u' , v' colour space and tangent of Planckian locus at T_{∞} in direction of blue wavelength.

NOTE 3 P_3 corresponds to a wavelength of 380 nm on the spectral locus of the u' , v' colour space.

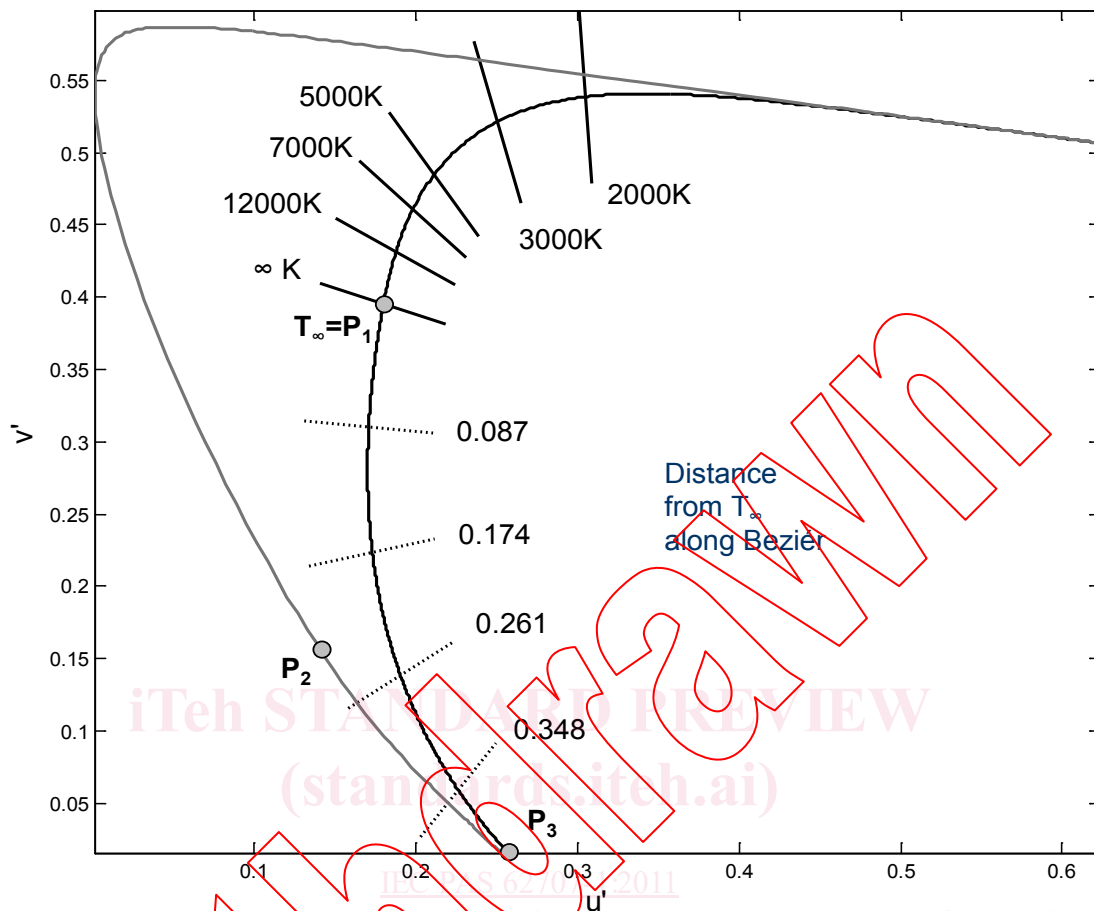


Figure 1 – Extension of the Planckian locus beyond T_{∞} .

The coordinates $u'_{BB}(p)$ and $v'_{BB}(p)$ of the grid points on the Planckian locus (BB = Black Body) are given in Annex A, as well as the unit increments $\Delta u'_{BB}(p)$ and $\Delta v'_{BB}(p)$ of the corresponding Judd isothermal lines.

The u' and v' coordinates of a grid point specified by the indices p and j are given by

$$u'(p, j) = u'_{BB}(p) + j \times \Delta u'_{BB}(p)$$

$$v'(p, j) = v'_{BB}(p) + j \times \Delta v'_{BB}(p)$$

or

$$u', v'(p, j) = (u'_{BB}(p) + j \times \Delta u'_{BB}(p); v'_{BB}(p) + j \times \Delta v'_{BB}(p))$$

The index $(p, j) = (0, 0)$ corresponds to the T_{∞} point and the coordinates are (rounded to five digits):

$$u'(0, 0) = 0,18006, v'(0, 0) = 0,39528 \text{ or}$$

$$u', v'(0, 0) = (0,18006; 0,39528)$$

Grid points in the u' , v' coordinate system can be translated into equivalent grid points in the x , y coordinate system using the following equations:

$$x(p, j) = 9u'(p, j)/(6u'(p, j) - 16v'(p, j) + 12)$$

$$y(p, j) = 4v'(p, j)/(6u'(p, j) - 16v'(p, j) + 12)$$

It is recommended to round grid point coordinates to 5 digits after the decimal sign.

4.2 White colour bins

White colour bins are specified as the area inside a quadrilateral. An origin (p, j) and a positive step size m, n along the Planckian locus (or its extension beyond T_∞) and the Judd lines respectively is given. The quadrilateral is constructed by connecting the four grid points

$[u', v' (p, j)]$, $[u', v' (p+m, j)]$, $[u', v' (p, j+n)]$ and $[u', v' (p+m, j+n)]$

or

$[x, y (p, j)]$, $[x, y (p+m, j)]$, $[x, y (p, j+n)]$ and $[x, y (p+m, j+n)]$

It should be noted that white colour bins with step sizes of m or n equal 1 are not considered to be practical in view of measurement accuracy.

4.3 Code for the chromaticity of white LEDs

4.3.1 Optional six digit code for the designation of white colour bins in x, y colour space

This subclause specifies an optional code for white colour bins in the x, y colour space using only six digits. The first four digits are reserved for the identification of the grid point representing the origin of the white colour bin. The last two digits are reserved for the number of steps along the Planckian locus (or its extension beyond T_∞) and the Judd lines respectively.

The first digit is:

“e” for $p \geq 0$ and $j < 0$

“f” for $p \geq 0$ and $j \geq 0$

“g” for $p < 0$ and $j \geq 0$

“h” for $p < 0$ and $j < 0$

The second and third digits represent the absolute value of p starting at “aa”. Only the following letters shall be used in the counting for the second and third digit:

a b c d e f g h j k l m n p r s t u v w x y z

The code for $|p|$ is specified in Table 1.

Table 1 – Code for |p|

p	0	1	...	7	8	...
code	aa	ab	...	ah	aj	...

The fourth digits represent the absolute value of j starting at "A". Only the following letters shall be used in the counting for the second and third digit:

A B C D E F G H J K L M N P R S T U V W X Y Z

The code for |j| is specified in Table 2.

Table 2 – Code for |j|

j	0	1	...	7	8	...
code	A	B	...	H	J	...

The fifth and sixth digits represent the number of steps m and n along the Planckian locus (or its extension beyond T_{∞}) and the Judd lines respectively. The following characters shall be used in the counting for the fifth and sixth digit:

(1) 2 3 4 5 6 7 8 9 a b c d e f g h j k l m n p r s t u v w x y z

The code for m and n is specified in Table 3.

Table 3 – Code for m and n

m, n	...	8	9	10	11	...
code	...	8	9	a	b	...

Examples for white colour bin codes are given in the following Table 4.

Table 4 – Examples for white colour bin codes

p	j	m	n	6 digit code
0	0	2	3	faaA23
9	-3	5	6	eakC56
0	0	10	10	faaAaa

An example of the codes of grid points around the T_{∞} point is given in Figure 2.