BSI Standards Publication

LED-binning

Part 1: General requirements
and white colour grid

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National foreword

This British Standard is the UK implementation of EN 62707-1:2014. It is identical to IEC 62707-1:2013. It supersedes DD IEC/PAS 62707-1:2011 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and Related Equipment, to Subcommittee CPL/34/1, Electric lamps.

A list of organizations represented on this committee can be obtained on request to its secretary.

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LED-binning -
Part 1: General requirements and white colour grid
(IEC 62707-1:2013)

Tri des LED -
Partie 1: Exigences générales et matrice
de couleur blanche
(CEI 62707-1:2013)

LED-Binning -
Allgemeine Anforderungen und
Weißfelder
(IEC 62707-1:2013)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 34A/1702/FDIS, future edition 1 of IEC 62707-1, prepared by SC 34A, "Lamps", of IEC/TC 34, "Lamps and related equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62707-1:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement   (dop)   2014-10-16

- latest date by which the national standards conflicting with the document have to be withdrawn   (dow)   2017-01-16

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The text of the International Standard IEC 62707-1:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

ISO 11664-1   NOTE Harmonized as EN ISO 11664-1.

ISO 11664-5   NOTE Harmonized as EN ISO 11664-5.

Annex ZA
(normative)

Normative references to international publications
with their corresponding European publications

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

NOTE   When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC/TS 62504	-	General lighting - LEDs and LED modules - Terms and definitions	-	-

CONTENTS

LED-BINNING –

Part 1: General requirements and white colour grid

1 Scope

This part of IEC 62707 specifies general requirements, a grid and a corresponding code for the colour binning of white LED packages emitting incoherent, visible radiation. It applies for LED packages.

Other parts of the IEC 62707 series covering chromaticity of coloured LED packages, luminous flux/luminous intensity, colour rendering and forward voltage are in preparation or under consideration.

NOTE 1   This International Standard does not apply for LED modules, LED lamps and LED luminaires.

NOTE 2   Even though the words "white light" are used, the purpose of this International Standard is not to define "white light", but to specify a grid and a corresponding colour code for the colour binning of white LED packages emitting incoherent, visible radiation. The area covered by the grid may differ from the definition of white light given in other standards or regulations.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

3 Terms and Definitions

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

3.1
bin
restricted range of LED package performance characteristics used to delimit a subset of LED packages near a nominal LED package performance as identified by chromaticity, photometric performance and forward voltage

3.2
grid
entity representing colour coordinates and specified by a set of grid points

3.3
grid point
colour coordinate in u', v' colour space (or its equivalent in the x, y colour space) 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

Note 1 to entry: The u', v' colour space is specified in ISO 11664-5 CIE S 014-5/E. The x, y colour space is specified in ISO 11664-1 CIE S 014-1/E.

3.4
white color bin
area inside a quadrilateral defined by four grid points

4   Chromaticity bins for white LED packages

4.1   Grid for white LED packages

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

The origin of the grid shall be on the Planckian locus at T_∞ (u'/v') = (0,180 06/0,395 28).

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 = 0,001 74. 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 = 0,0017 4 has been chosen as providing for the best alignment with existing chromaticity requirements.

The Planckian locus shall be extended beyond T_∞ (towards blue) as follows (see Figure 1):

- Quadratic Bézier locus defined by three points:
    - P_1: T_∞ (u'/v') = (0,180 06/0,395 28)
    - P_2: (u'/v') = (0,141 22/0,155 93)
    - P_3: (u'/v') = (0,256 80/0,016 59)
- The Bézier locus is B(t) = $P_1 \times (1-t)^2 + 2P_2 \times t \times (1-t) + P_3 \times t^2$; $t \in (0;1)$.

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.
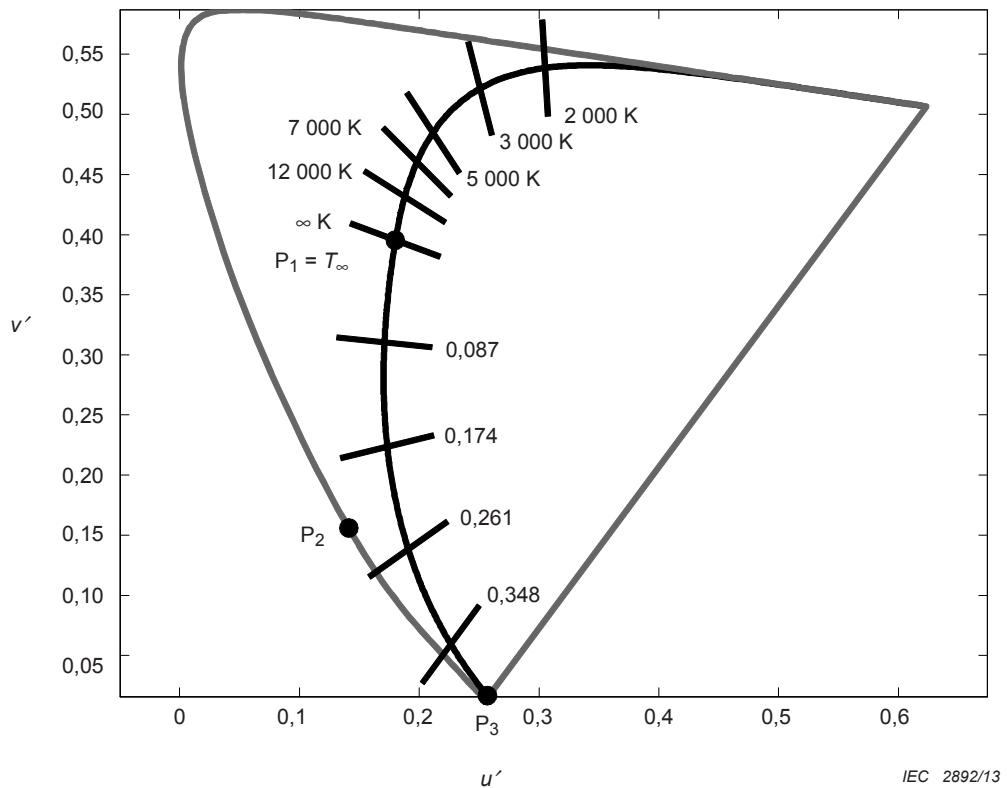
The decimal values at the Beziér curve give the distance from T_∞ along the Beziér.

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) and the extension on the Planckian locus are given in Annex A and Annex B, 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):

$u'(0, 0) = 0{,}180\ 06$, $v'(0, 0) = 0{,}395\ 28$ or

$u', v'(0, 0) = (0{,}180\ 06; 0{,}395\ 28)$

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 defined 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 LED packages

4.3.1 Optional six digit code for the designation of white colour bins

Subclause 4.3.1 specifies an optional code for white colour bins 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

NOTE 1 The coding for the second and third digit can also be found in the column "Code" in Annex A ($p \geq 0$), respectively in Annex B ($p < 0$).

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 forth 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.

NOTE 2   The fourth digit is limited to |j| ≤ 22.

Table 2 – Code for |j|

|j|	0	1	2	3	4	5	6	7	8	9	10
code	A	B	C	D	E	F	G	H	J	K	L

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.

NOTE 3   The fifth and sixth digit is limited to $|m| ≤ 32$ respectively $|n| ≤ 32$.

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 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	eakD56
0	0	10	10	faaAaa
43	-3	6	8	ebxD68
41	-5	6	8	ebvF68
45	-1	6	8	ebzB68

An example of the codes of grid points around the T_∞ point is given in Figure 2.
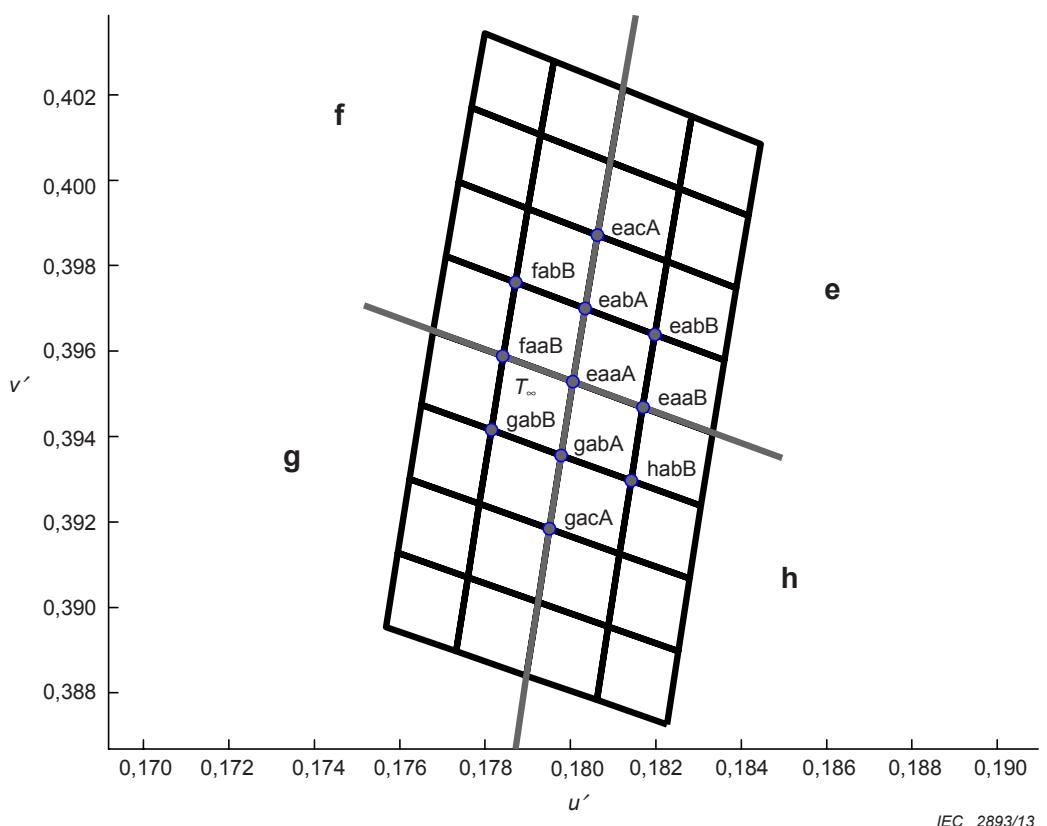
Figure 2 – Example of grid points with four digit designation

An example of a 6 by 8 white color bin with the six digit code is given in Figure 3.
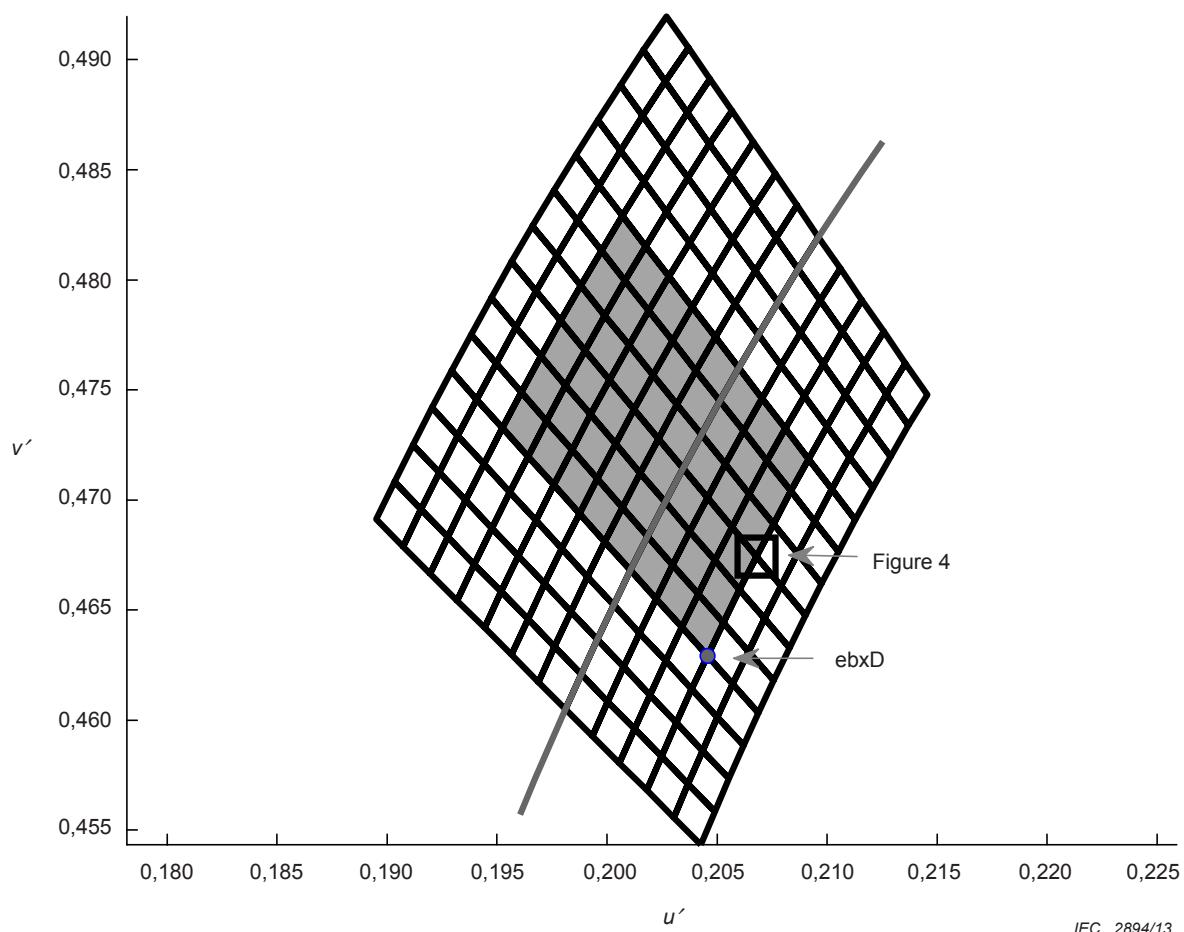
The pale curve represents the Planckian locus.

Figure 3 – Example of white color bin ebxD68

Figure 4 is a detail of Figure 3 and shows the very small difference between the grid lines and the border lines of the bin.

IEC 2895/13

Figure 4 – Detail of Figure 3

4.3.2   Other codes for the designation of white colour bins

Other codes for the designation of white colour bins may be applicable (e. g. application-specific).

Annex A
(informative)

White binning grid coordinates for $p \geq 0$

Table A.1 – White binning grid coordinates for the grid points along the Planckian locus ($p \geq 0$)

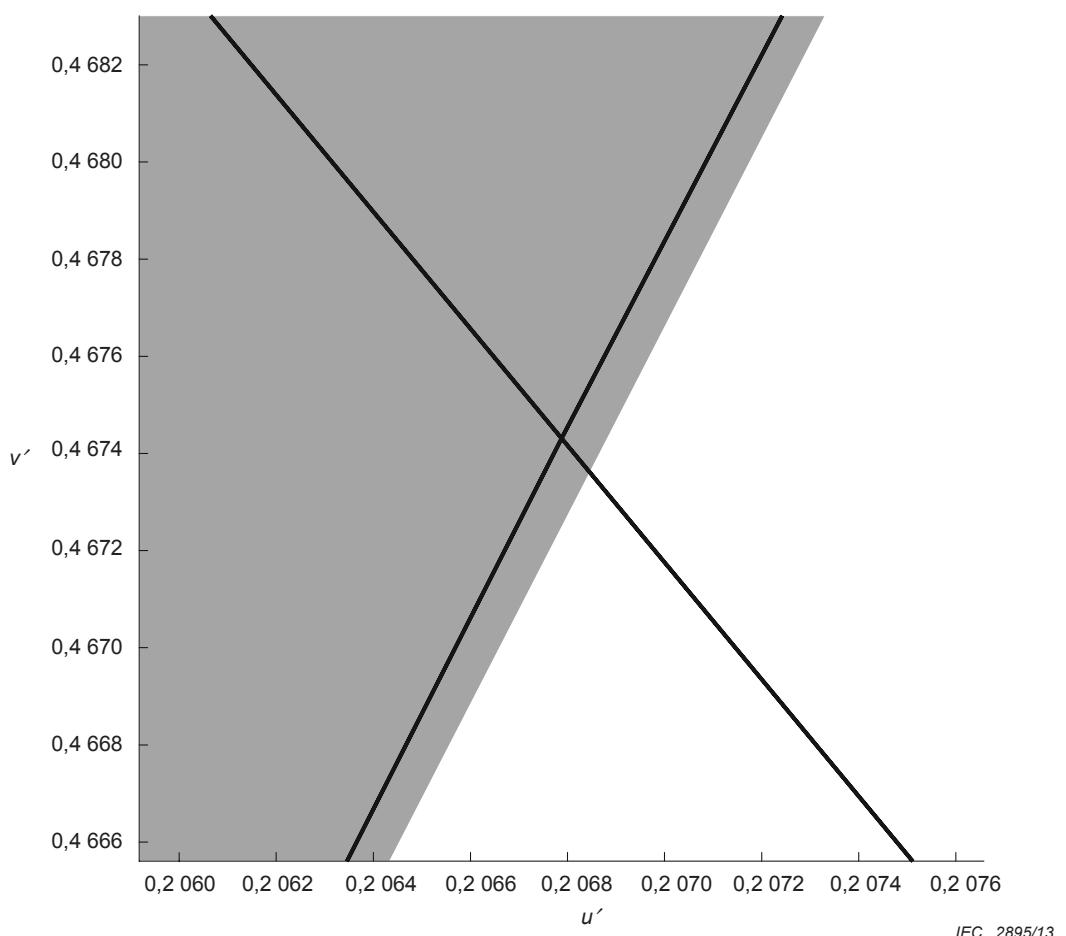| p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
0	aa	0,180064	0,395283	-0,00163	0,000597
1	ab	0,180346	0,397	-0,00163	0,000608
2	ac	0,180634	0,398716	-0,00163	0,00062
3	ad	0,180928	0,400431	-0,00162	0,000633
4	ae	0,181229	0,402145	-0,00162	0,000646
5	af	0,181537	0,403857	-0,00161	0,00066
6	ag	0,181853	0,405568	-0,0016	0,000674
7	ah	0,182176	0,407278	-0,0016	0,000689
8	aj	0,182508	0,408986	-0,00159	0,000704
9	ak	0,182848	0,410692	-0,00158	0,000719
10	al	0,183197	0,412397	-0,00158	0,000735
11	am	0,183554	0,4141	-0,00157	0,000751
12	an	0,183921	0,415801	-0,00156	0,000767
13	ap	0,184297	0,4175	-0,00155	0,000784
14	ar	0,184682	0,419196	-0,00154	0,000801
15	as	0,185078	0,420891	-0,00154	0,000817
16	at	0,185483	0,422583	-0,00153	0,000834
17	au	0,185899	0,424273	-0,00152	0,000852
18	av	0,186326	0,42596	-0,00151	0,000869
19	aw	0,186763	0,427644	-0,0015	0,000886
20	ax	0,187211	0,429325	-0,00149	0,000904
21	ay	0,18767	0,431003	-0,00148	0,000921
22	az	0,188141	0,432678	-0,00147	0,000939
23	ba	0,188623	0,43435	-0,00145	0,000956
24	bb	0,189118	0,436018	-0,00144	0,000974
25	bc	0,189624	0,437683	-0,00143	0,000992
26	bd	0,190143	0,439344	-0,00142	0,001009
27	be	0,190674	0,441001	-0,0014	0,001027
28	bf	0,191218	0,442654	-0,00139	0,001044
29	bg	0,191775	0,444302	-0,00138	0,001062
30	bh	0,192346	0,445946	-0,00136	0,001079
31	bj	0,192929	0,447585	-0,00135	0,001097
32	bk	0,193527	0,449219	-0,00134	0,001114
33	bl	0,194138	0,450848	-0,00132	0,001131
34	bm	0,194764	0,452472	-0,00131	0,001148
35	bn	0,195403	0,45409	-0,00129	0,001165
36	bp	0,196058	0,455702	-0,00128	0,001182

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
37	br	0,196727	0,457309	-0,00126	0,001198
38	bs	0,197411	0,458908	-0,00125	0,001215
39	bt	0,198111	0,460502	-0,00123	0,001231
40	bu	0,198825	0,462088	-0,00121	0,001247
41	bv	0,199556	0,463667	-0,0012	0,001263
42	bw	0,200302	0,465239	-0,00118	0,001278
43	bx	0,201065	0,466803	-0,00116	0,001294
44	by	0,201844	0,468359	-0,00115	0,001309
45	bz	0,202639	0,469907	-0,00113	0,001323
46	ca	0,203451	0,471445	-0,00111	0,001338
47	cb	0,20428	0,472975	-0,00109	0,001352
48	cc	0,205126	0,474496	-0,00108	0,001367
49	cd	0,205989	0,476006	-0,00106	0,00138
50	ce	0,20687	0,477507	-0,00104	0,001394
51	cf	0,207768	0,478997	-0,00102	0,001407
52	cg	0,208685	0,480477	-0,00101	0,00142
53	ch	0,209619	0,481945	-0,00099	0,001433
54	cj	0,210571	0,483401	-0,00097	0,001445
55	ck	0,211541	0,484845	-0,00095	0,001457
56	cl	0,21253	0,486277	-0,00093	0,001469
57	cm	0,213537	0,487696	-0,00091	0,00148
58	cn	0,214562	0,489102	-0,0009	0,001491
59	cp	0,215606	0,490494	-0,00088	0,001502
60	cr	0,216669	0,491871	-0,00086	0,001513
61	cs	0,21775	0,493235	-0,00084	0,001523
62	ct	0,21885	0,494583	-0,00082	0,001533
63	cu	0,219969	0,495915	-0,00081	0,001543
64	cv	0,221107	0,497232	-0,00079	0,001552
65	cw	0,222263	0,498532	-0,00077	0,001561
66	cx	0,223437	0,499816	-0,00075	0,00157
67	cy	0,224631	0,501082	-0,00073	0,001578
68	cz	0,225842	0,502331	-0,00072	0,001586
69	da	0,227073	0,503562	-0,0007	0,001594
70	db	0,228321	0,504774	-0,00068	0,001601
71	dc	0,229587	0,505967	-0,00066	0,001609
72	dd	0,230871	0,507141	-0,00065	0,001615
73	de	0,232173	0,508296	-0,00063	0,001622
74	df	0,233492	0,50943	-0,00061	0,001628
75	dg	0,234829	0,510544	-0,0006	0,001635
76	dh	0,236182	0,511638	-0,00058	0,00164
77	dj	0,237552	0,512711	-0,00056	0,001646
78	dk	0,238939	0,513762	-0,00055	0,001651
79	dl	0,240341	0,514792	-0,00053	0,001657
80	dm	0,241759	0,515801	-0,00052	0,001662

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
81	dn	0,243192	0,516787	-0,0005	0,001666
82	dp	0,24464	0,517752	-0,00049	0,001671
83	dr	0,246103	0,518694	-0,00047	0,001675
84	ds	0,24758	0,519614	-0,00046	0,001679
85	dt	0,24907	0,520512	-0,00044	0,001683
86	du	0,250574	0,521387	-0,00043	0,001686
87	dv	0,252091	0,52224	-0,00041	0,00169
88	dw	0,25362	0,52307	-0,0004	0,001693
89	dx	0,255161	0,523878	-0,00039	0,001696
90	dy	0,256714	0,524663	-0,00038	0,001699
91	dz	0,258278	0,525426	-0,00036	0,001702
92	ea	0,259852	0,526166	-0,00035	0,001704
93	eb	0,261437	0,526885	-0,00034	0,001707
94	ec	0,263032	0,527581	-0,00033	0,001709
95	ed	0,264636	0,528256	-0,00031	0,001711
96	ee	0,266248	0,528908	-0,0003	0,001714
97	ef	0,26787	0,52954	-0,00029	0,001715
98	eg	0,269499	0,53015	-0,00028	0,001717
99	eh	0,271136	0,530739	-0,00027	0,001719
100	ej	0,272781	0,531308	-0,00026	0,001721
101	ek	0,274432	0,531856	-0,00025	0,001722
102	el	0,27609	0,532383	-0,00024	0,001724
103	em	0,277755	0,532891	-0,00023	0,001725
104	en	0,279425	0,53338	-0,00022	0,001726
105	ep	0,2811	0,533849	-0,00021	0,001727
106	er	0,282781	0,534299	-0,0002	0,001728
107	es	0,284467	0,534731	-0,00019	0,001729
108	et	0,286157	0,535144	-0,00018	0,00173
109	eu	0,287851	0,53554	-0,00018	0,001731
110	ev	0,28955	0,535918	-0,00017	0,001732
111	ew	0,291252	0,536278	-0,00016	0,001733
112	ex	0,292957	0,536622	-0,00015	0,001733
113	ey	0,294666	0,53695	-0,00014	0,001734
114	ez	0,296378	0,537261	-0,00014	0,001735
115	fa	0,298093	0,537557	-0,00013	0,001735
116	fb	0,29981	0,537837	-0,00012	0,001736
117	fc	0,30153	0,538102	-0,00012	0,001736
118	fd	0,303252	0,538353	-0,00011	0,001737
119	fe	0,304976	0,538589	-0,0001	0,001737
120	ff	0,306701	0,538811	-9,6E-05	0,001737
121	fg	0,308429	0,53902	-9E-05	0,001738
122	fh	0,310158	0,539215	-8,4E-05	0,001738
123	fj	0,311888	0,539397	-7,8E-05	0,001738
124	fk	0,31362	0,539566	-7,3E-05	0,001738

p	Code	u‘BB	v‘BB	Δu‘BB	Δv‘BB
125	fl	0,315353	0,539724	-6,7E-05	0,001739
126	fm	0,317087	0,539869	-6,2E-05	0,001739
127	fn	0,318822	0,540002	-5,7E-05	0,001739
128	fp	0,320557	0,540124	-5,2E-05	0,001739
129	fr	0,322294	0,540235	-4,7E-05	0,001739
130	fs	0,324031	0,540335	-4,2E-05	0,001739
131	ft	0,325769	0,540424	-3,7E-05	0,00174
132	fu	0,327507	0,540503	-3,3E-05	0,00174
133	fv	0,329246	0,540573	-2,9E-05	0,00174
134	fw	0,330985	0,540632	-2,4E-05	0,00174
135	fx	0,332724	0,540682	-2E-05	0,00174
136	fy	0,334463	0,540723	-1,6E-05	0,00174
137	fz	0,336203	0,540755	-1,2E-05	0,00174
138	ga	0,337943	0,540778	-8,4E-06	0,00174
139	gb	0,339683	0,540793	-4,7E-06	0,00174
140	gc	0,341423	0,5408	-1,1E-06	0,00174
141	gd	0,343163	0,540798	2,4E-06	0,00174
142	ge	0,344903	0,540789	5,79E-06	0,00174
143	gf	0,346643	0,540772	9,09E-06	0,00174
144	gg	0,348383	0,540748	1,23E-05	0,00174
145	gh	0,350122	0,540717	1,54E-05	0,00174
146	gj	0,351862	0,540679	1,85E-05	0,00174
147	gk	0,353601	0,540634	2,14E-05	0,00174
148	gl	0,355341	0,540583	2,43E-05	0,00174
149	gm	0,35708	0,540525	2,71E-05	0,00174
150	gn	0,358818	0,540461	2,98E-05	0,00174
151	gp	0,360557	0,540391	3,24E-05	0,00174
152	gr	0,362295	0,540315	3,5E-05	0,00174
153	gs	0,364033	0,540234	3,75E-05	0,00174
154	gt	0,365771	0,540147	3,99E-05	0,00174
155	gu	0,367509	0,540055	4,22E-05	0,001739
156	gv	0,369246	0,539957	4,45E-05	0,001739
157	gw	0,370983	0,539855	4,67E-05	0,001739
158	gx	0,37272	0,539747	4,89E-05	0,001739
159	gy	0,374456	0,539635	5,09E-05	0,001739
160	gz	0,376192	0,539519	5,3E-05	0,001739
161	ha	0,377928	0,539397	5,49E-05	0,001739
162	hb	0,379663	0,539272	5,68E-05	0,001739
163	hc	0,381399	0,539142	5,87E-05	0,001739
164	hd	0,383133	0,539008	6,05E-05	0,001739
165	he	0,384868	0,538871	6,23E-05	0,001739
166	hf	0,386602	0,538729	6,4E-05	0,001739
167	hg	0,388336	0,538584	6,56E-05	0,001739
168	hh	0,39007	0,538435	6,72E-05	0,001739

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
169	hj	0,391803	0,538282	6,88E-05	0,001739
170	hk	0,393536	0,538126	7,03E-05	0,001739
171	hl	0,395269	0,537967	7,17E-05	0,001739
172	hm	0,397001	0,537804	7,32E-05	0,001738
173	hn	0,398733	0,537639	7,46E-05	0,001738
174	hp	0,400465	0,53747	7,59E-05	0,001738
175	hr	0,402197	0,537299	7,72E-05	0,001738
176	hs	0,403928	0,537124	7,85E-05	0,001738
177	ht	0,405659	0,536947	7,97E-05	0,001738
178	hu	0,407389	0,536767	8,09E-05	0,001738
179	hv	0,40912	0,536585	8,2E-05	0,001738
180	hw	0,41085	0,5364	8,31E-05	0,001738
181	hx	0,41258	0,536212	8,42E-05	0,001738
182	hy	0,414309	0,536023	8,53E-05	0,001738
183	hz	0,416039	0,535831	8,63E-05	0,001738
184	ja	0,417768	0,535636	8,73E-05	0,001738
185	jb	0,419497	0,53544	8,82E-05	0,001738
186	jc	0,421225	0,535241	8,92E-05	0,001738
187	jd	0,422954	0,535041	9,01E-05	0,001738
188	je	0,424682	0,534838	9,09E-05	0,001738
189	jf	0,42641	0,534634	9,18E-05	0,001738
190	jg	0,428138	0,534427	9,26E-05	0,001738
191	jh	0,429865	0,534219	9,34E-05	0,001737
192	jj	0,431593	0,53401	9,42E-05	0,001737
193	jk	0,43332	0,533798	9,49E-05	0,001737
194	jl	0,435047	0,533585	9,56E-05	0,001737
195	jm	0,436773	0,53337	9,63E-05	0,001737
196	jn	0,4385	0,533154	9,7E-05	0,001737
197	jp	0,440226	0,532936	9,77E-05	0,001737
198	jr	0,441952	0,532717	9,83E-05	0,001737
199	js	0,443678	0,532497	9,89E-05	0,001737
200	jt	0,445404	0,532275	9,95E-05	0,001737
201	ju	0,44713	0,532052	0,0001	0,001737
202	jv	0,448855	0,531828	0,000101	0,001737
203	jw	0,45058	0,531602	0,000101	0,001737
204	jx	0,452306	0,531375	0,000102	0,001737
205	jy	0,454031	0,531147	0,000102	0,001737
206	jz	0,455755	0,530918	0,000103	0,001737
207	ka	0,45748	0,530688	0,000103	0,001737
208	kb	0,459205	0,530457	0,000104	0,001737
209	kc	0,460929	0,530225	0,000104	0,001737
210	kd	0,462654	0,529992	0,000105	0,001737
211	ke	0,464378	0,529758	0,000105	0,001737
212	kf	0,466102	0,529523	0,000105	0,001737

p	Code	*u'*BB	*v'*BB	Δ*u'*BB	Δ*v'*BB
213	kg	0,467826	0,529287	0,000106	0,001737
214	kh	0,46955	0,529051	0,000106	0,001737
215	kj	0,471273	0,528814	0,000106	0,001737
216	kk	0,472997	0,528575	0,000107	0,001737
217	kl	0,474721	0,528336	0,000107	0,001737
218	km	0,476444	0,528097	0,000107	0,001737
219	kn	0,478167	0,527856	0,000108	0,001737
220	kp	0,47989	0,527615	0,000108	0,001737
221	kr	0,481614	0,527374	0,000108	0,001737
222	ks	0,483337	0,527131	0,000109	0,001737
223	kt	0,48506	0,526888	0,000109	0,001737
224	ku	0,486782	0,526645	0,000109	0,001737
225	kv	0,488505	0,526401	0,000109	0,001737
226	kw	0,490228	0,526156	0,00011	0,001737
227	kx	0,491951	0,525911	0,00011	0,001737
228	ky	0,493673	0,525665	0,00011	0,001737
229	kz	0,495396	0,525419	0,00011	0,001736
230	la	0,497118	0,525172	0,000111	0,001736
231	lb	0,49884	0,524925	0,000111	0,001736
232	lc	0,500563	0,524678	0,000111	0,001736
233	ld	0,502285	0,52443	0,000111	0,001736
234	le	0,504007	0,524181	0,000111	0,001736
235	lf	0,505729	0,523933	0,000112	0,001736
236	lg	0,507451	0,523683	0,000112	0,001736
237	lh	0,509173	0,523434	0,000112	0,001736
238	lj	0,510895	0,523184	0,000112	0,001736
239	lk	0,512617	0,522934	0,000112	0,001736
240	ll	0,514339	0,522683	0,000112	0,001736
241	lm	0,516061	0,522432	0,000113	0,001736
242	ln	0,517783	0,522181	0,000113	0,001736
243	lp	0,519504	0,52193	0,000113	0,001736
244	lr	0,521226	0,521678	0,000113	0,001736
245	ls	0,522948	0,521426	0,000113	0,001736
246	lt	0,524669	0,521174	0,000113	0,001736
247	lu	0,526391	0,520921	0,000113	0,001736
248	lv	0,528113	0,520668	0,000113	0,001736
249	lw	0,529834	0,520415	0,000113	0,001736
250	lx	0,531556	0,520162	0,000114	0,001736
251	ly	0,533277	0,519909	0,000114	0,001736
252	lz	0,534998	0,519655	0,000114	0,001736
253	ma	0,53672	0,519401	0,000114	0,001736
254	mb	0,538441	0,519147	0,000114	0,001736
255	mc	0,540163	0,518893	0,000114	0,001736
256	md	0,541884	0,518639	0,000114	0,001736

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
257	me	0,543605	0,518385	0,000114	0,001736
258	mf	0,545326	0,51813	0,000114	0,001736
259	mg	0,547048	0,517875	0,000114	0,001736
260	mh	0,548769	0,51762	0,000114	0,001736
261	mj	0,55049	0,517365	0,000114	0,001736
262	mk	0,552211	0,51711	0,000114	0,001736
263	ml	0,553932	0,516855	0,000114	0,001736
264	mm	0,555654	0,516599	0,000115	0,001736
265	mn	0,557375	0,516344	0,000115	0,001736
266	mp	0,559096	0,516088	0,000115	0,001736
267	mr	0,560817	0,515832	0,000115	0,001736
268	ms	0,562538	0,515576	0,000115	0,001736
269	mt	0,564259	0,515321	0,000115	0,001736
270	mu	0,56598	0,515064	0,000115	0,001736
271	mv	0,567701	0,514808	0,000115	0,001736
272	mw	0,569422	0,514552	0,000115	0,001736
273	mx	0,571143	0,514296	0,000115	0,001736
274	my	0,572864	0,51404	0,000115	0,001736
275	mz	0,574585	0,513783	0,000115	0,001736
276	na	0,576306	0,513527	0,000115	0,001736
277	nb	0,578027	0,51327	0,000115	0,001736
278	nc	0,579748	0,513013	0,000115	0,001736
279	nd	0,581469	0,512757	0,000115	0,001736
280	ne	0,58319	0,5125	0,000115	0,001736
281	nf	0,584911	0,512243	0,000115	0,001736
282	ng	0,586632	0,511987	0,000115	0,001736
283	nh	0,588353	0,51173	0,000115	0,001736
284	nj	0,590074	0,511473	0,000115	0,001736
285	nk	0,591795	0,511216	0,000115	0,001736
286	nl	0,593516	0,510959	0,000115	0,001736
287	nm	0,595237	0,510702	0,000115	0,001736
288	nn	0,596958	0,510445	0,000115	0,001736
289	np	0,598678	0,510188	0,000115	0,001736
290	nr	0,600399	0,50993	0,000115	0,001736
291	ns	0,60212	0,509673	0,000115	0,001736
292	nt	0,603841	0,509416	0,000115	0,001736
293	nu	0,605562	0,509159	0,000115	0,001736
294	nv	0,607283	0,508901	0,000115	0,001736
295	nw	0,609004	0,508644	0,000115	0,001736
296	nx	0,610725	0,508387	0,000115	0,001736
297	ny	0,612445	0,508129	0,000115	0,001736
298	nz	0,614166	0,507872	0,000115	0,001736
299	pa	0,615887	0,507615	0,000115	0,001736
300	pb	0,617608	0,507357	0,000115	0,001736

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
301	pc	0,619329	0,5071	0,000115	0,001736
302	pd	0,62105	0,506842	0,000116	0,001736
303	pe	0,62277	0,506584	0,000116	0,001736

Annex B
(informative)

White binning grid coordinates for *p* < 0

**Table B.1 – White binning grid coordinates for the grid points
along the extension of the Planckian locus (*p* < 0)**

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
0	aa	0,18006	0,39528	-0,00163	0,000597
-1	ab	0,179783	0,393562	-0,00164	0,00059
-2	ac	0,17951	0,391844	-0,00164	0,000583
-3	ad	0,17924	0,390125	-0,00164	0,000576
-4	ae	0,178973	0,388405	-0,00164	0,000569
-5	af	0,17871	0,386685	-0,00165	0,000562
-6	ag	0,178451	0,384965	-0,00165	0,000555
-7	ah	0,178195	0,383244	-0,00165	0,000548
-8	aj	0,177943	0,381522	-0,00165	0,000541
-9	ak	0,177695	0,3798	-0,00166	0,000534
-10	al	0,17745	0,378077	-0,00166	0,000526
-11	am	0,177208	0,376354	-0,00166	0,000519
-12	an	0,176971	0,37463	-0,00166	0,000511
-13	ap	0,176737	0,372906	-0,00167	0,000504
-14	ar	0,176507	0,371181	-0,00167	0,000496
-15	as	0,176281	0,369456	-0,00167	0,000489
-16	at	0,176059	0,36773	-0,00167	0,000481
-17	au	0,17584	0,366004	-0,00167	0,000473
-18	av	0,175625	0,364278	-0,00168	0,000465
-19	aw	0,175414	0,36255	-0,00168	0,000457
-20	ax	0,175207	0,360823	-0,00168	0,000449
-21	ay	0,175004	0,359095	-0,00168	0,000441
-22	az	0,174804	0,357366	-0,00169	0,000433
-23	ba	0,174609	0,355637	-0,00169	0,000425
-24	bb	0,174418	0,353908	-0,00169	0,000416
-25	bc	0,17423	0,352178	-0,00169	0,000408
-26	bd	0,174047	0,350447	-0,00169	0,000399
-27	be	0,173868	0,348717	-0,0017	0,000391
-28	bf	0,173692	0,346986	-0,0017	0,000382
-29	bg	0,173521	0,345254	-0,0017	0,000373
-30	bh	0,173354	0,343522	-0,0017	0,000365
-31	bj	0,173191	0,34179	-0,0017	0,000356
-32	bk	0,173032	0,340057	-0,00171	0,000347
-33	bl	0,172878	0,338324	-0,00171	0,000338
-34	bm	0,172727	0,33659	-0,00171	0,000329
-35	bn	0,172581	0,334857	-0,00171	0,00032
-36	bp	0,172439	0,333122	-0,00171	0,00031

p	Code	*u*'BB	*v*'BB	Δ*u*'BB	Δ*v*'BB
-37	br	0,172301	0,331388	-0,00171	0,000301
-38	bs	0,172168	0,329653	-0,00172	0,000292
-39	bt	0,172039	0,327918	-0,00172	0,000282
-40	bu	0,171915	0,326182	-0,00172	0,000273
-41	bv	0,171794	0,324446	-0,00172	0,000263
-42	bw	0,171678	0,32271	-0,00172	0,000253
-43	bx	0,171567	0,320974	-0,00172	0,000244
-44	by	0,17146	0,319237	-0,00172	0,000234
-45	bz	0,171358	0,3175	-0,00173	0,000224
-46	ca	0,17126	0,315763	-0,00173	0,000214
-47	cb	0,171166	0,314025	-0,00173	0,000204
-48	cc	0,171077	0,312288	-0,00173	0,000194
-49	cd	0,170993	0,31055	-0,00173	0,000184
-50	ce	0,170914	0,308811	-0,00173	0,000173
-51	cf	0,170839	0,307073	-0,00173	0,000163
-52	cg	0,170768	0,305334	-0,00173	0,000152
-53	ch	0,170703	0,303596	-0,00173	0,000142
-54	cj	0,170642	0,301857	-0,00174	0,000131
-55	ck	0,170586	0,300118	-0,00174	0,000121
-56	cl	0,170535	0,298378	-0,00174	0,00011
-57	cm	0,170488	0,296639	-0,00174	9,9E-05
-58	cn	0,170446	0,2949	-0,00174	8,82E-05
-59	cp	0,17041	0,29316	-0,00174	7,72E-05
-60	cr	0,170378	0,29142	-0,00174	6,62E-05
-61	cs	0,170351	0,28968	-0,00174	5,51E-05
-62	ct	0,170329	0,287941	-0,00174	4,39E-05
-63	cu	0,170312	0,286201	-0,00174	3,27E-05
-64	cv	0,1703	0,284461	-0,00174	2,13E-05
-65	cw	0,170293	0,282721	-0,00174	9,97E-06
-66	cx	0,170291	0,280981	-0,00174	-1,5E-06
-67	cy	0,170294	0,279241	-0,00174	-1,3E-05
-68	cz	0,170302	0,277501	-0,00174	-2,5E-05
-69	da	0,170316	0,275761	-0,00174	-3,6E-05
-70	db	0,170335	0,274021	-0,00174	-4,8E-05
-71	dc	0,170359	0,272281	-0,00174	-6E-05
-72	dd	0,170388	0,270541	-0,00174	-7,1E-05
-73	de	0,170422	0,268802	-0,00174	-8,3E-05
-74	df	0,170462	0,267062	-0,00174	-9,5E-05
-75	dg	0,170507	0,265323	-0,00174	-0,00011
-76	dh	0,170557	0,263583	-0,00174	-0,00012
-77	dj	0,170613	0,261844	-0,00174	-0,00013
-78	dk	0,170674	0,260105	-0,00173	-0,00014
-79	dl	0,170741	0,258367	-0,00173	-0,00016
-80	dm	0,170813	0,256628	-0,00173	-0,00017

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
-81	dn	0,170891	0,25489	-0,00173	-0,00018
-82	dp	0,170974	0,253152	-0,00173	-0,00019
-83	dr	0,171063	0,251414	-0,00173	-0,0002
-84	ds	0,171157	0,249677	-0,00173	-0,00022
-85	dt	0,171257	0,24794	-0,00172	-0,00023
-86	du	0,171363	0,246203	-0,00172	-0,00024
-87	dv	0,171474	0,244466	-0,00172	-0,00025
-88	dw	0,171592	0,24273	-0,00172	-0,00027
-89	dx	0,171714	0,240995	-0,00172	-0,00028
-90	dy	0,171843	0,239259	-0,00172	-0,00029
-91	dz	0,171978	0,237525	-0,00171	-0,00031
-92	ea	0,172118	0,23579	-0,00171	-0,00032
-93	eb	0,172264	0,234056	-0,00171	-0,00033
-94	ec	0,172416	0,232323	-0,00171	-0,00034
-95	ed	0,172574	0,23059	-0,0017	-0,00036
-96	ee	0,172738	0,228858	-0,0017	-0,00037
-97	ef	0,172908	0,227126	-0,0017	-0,00038
-98	eg	0,173084	0,225395	-0,00169	-0,00039
-99	eh	0,173266	0,223665	-0,00169	-0,00041
-100	ej	0,173455	0,221935	-0,00169	-0,00042
-101	ek	0,173649	0,220206	-0,00169	-0,00043
-102	el	0,173849	0,218478	-0,00168	-0,00045
-103	em	0,174056	0,21675	-0,00168	-0,00046
-104	en	0,174269	0,215023	-0,00167	-0,00047
-105	ep	0,174488	0,213297	-0,00167	-0,00048
-106	er	0,174713	0,211571	-0,00167	-0,0005
-107	es	0,174945	0,209847	-0,00166	-0,00051
-108	et	0,175183	0,208123	-0,00166	-0,00052
-109	eu	0,175427	0,206401	-0,00166	-0,00054
-110	ev	0,175678	0,204679	-0,00165	-0,00055
-111	ew	0,175935	0,202958	-0,00165	-0,00056
-112	ex	0,176199	0,201238	-0,00164	-0,00057
-113	ey	0,176469	0,199519	-0,00164	-0,00059
-114	ez	0,176745	0,197801	-0,00163	-0,0006
-115	fa	0,177028	0,196084	-0,00163	-0,00061
-116	fb	0,177318	0,194369	-0,00162	-0,00062
-117	fc	0,177614	0,192654	-0,00162	-0,00064
-118	fd	0,177917	0,190941	-0,00161	-0,00065
-119	fe	0,178227	0,189228	-0,00161	-0,00066
-120	ff	0,178543	0,187517	-0,0016	-0,00067
-121	fg	0,178866	0,185808	-0,0016	-0,00069
-122	fh	0,179195	0,184099	-0,00159	-0,0007
-123	fj	0,179532	0,182392	-0,00159	-0,00071
-124	fk	0,179875	0,180686	-0,00158	-0,00072

p	Code	u‘BB	v‘BB	Δu‘BB	Δv‘BB
-125	fl	0,180225	0,178982	-0,00158	-0,00074
-126	fm	0,180582	0,177279	-0,00157	-0,00075
-127	fn	0,180945	0,175577	-0,00157	-0,00076
-128	fp	0,181316	0,173877	-0,00156	-0,00077
-129	fr	0,181694	0,172178	-0,00155	-0,00078
-130	fs	0,182078	0,170481	-0,00155	-0,0008
-131	ft	0,182469	0,168786	-0,00154	-0,00081
-132	fu	0,182868	0,167092	-0,00153	-0,00082
-133	fv	0,183273	0,1654	-0,00153	-0,00083
-134	fw	0,183685	0,16371	-0,00152	-0,00084
-135	fx	0,184105	0,162021	-0,00152	-0,00085
-136	fy	0,184531	0,160334	-0,00151	-0,00087
-137	fz	0,184965	0,158649	-0,0015	-0,00088
-138	ga	0,185406	0,156966	-0,0015	-0,00089
-139	gb	0,185854	0,155284	-0,00149	-0,0009
-140	gc	0,186309	0,153605	-0,00148	-0,00091
-141	gd	0,186771	0,151927	-0,00148	-0,00092
-142	ge	0,187241	0,150252	-0,00147	-0,00093
-143	gf	0,187718	0,148579	-0,00146	-0,00094
-144	gg	0,188202	0,146907	-0,00145	-0,00096
-145	gh	0,188693	0,145238	-0,00145	-0,00097
-146	gj	0,189191	0,143571	-0,00144	-0,00098
-147	gk	0,189697	0,141906	-0,00143	-0,00099
-148	gl	0,19021	0,140244	-0,00143	-0,001
-149	gm	0,190731	0,138583	-0,00142	-0,00101
-150	gn	0,191259	0,136925	-0,00141	-0,00102
-151	gp	0,191794	0,13527	-0,0014	-0,00103
-152	gr	0,192337	0,133616	-0,0014	-0,00104
-153	gs	0,192887	0,131966	-0,00139	-0,00105
-154	gt	0,193445	0,130317	-0,00138	-0,00106
-155	gu	0,194009	0,128672	-0,00137	-0,00107
-156	gv	0,194582	0,127029	-0,00137	-0,00108
-157	gw	0,195162	0,125388	-0,00136	-0,00109
-158	gx	0,195749	0,12375	-0,00135	-0,0011
-159	gy	0,196344	0,122115	-0,00134	-0,00111
-160	gz	0,196946	0,120483	-0,00133	-0,00112
-161	ha	0,197556	0,118853	-0,00133	-0,00113
-162	hb	0,198174	0,117226	-0,00132	-0,00113
-163	hc	0,198799	0,115602	-0,00131	-0,00114
-164	hd	0,199431	0,113981	-0,0013	-0,00115
-165	he	0,200071	0,112363	-0,0013	-0,00116
-166	hf	0,200719	0,110748	-0,00129	-0,00117
-167	hg	0,201374	0,109136	-0,00128	-0,00118
-168	hh	0,202036	0,107528	-0,00127	-0,00119

p	Code	u'BB	v'BB	Δu'BB	Δv'BB
-169	hj	0,202707	0,105922	-0,00126	-0,0012
-170	hk	0,203385	0,104319	-0,00126	-0,0012
-171	hl	0,20407	0,10272	-0,00125	-0,00121
-172	hm	0,204763	0,101124	-0,00124	-0,00122
-173	hn	0,205464	0,099531	-0,00123	-0,00123
-174	hp	0,206172	0,097942	-0,00122	-0,00124
-175	hr	0,206888	0,096356	-0,00122	-0,00124
-176	hs	0,207611	0,094773	-0,00121	-0,00125
-177	ht	0,208342	0,093194	-0,0012	-0,00126
-178	hu	0,20908	0,091619	-0,00119	-0,00127
-179	hv	0,209827	0,090047	-0,00119	-0,00127
-180	hw	0,21058	0,088479	-0,00118	-0,00128
-181	hx	0,211342	0,086914	-0,00117	-0,00129
-182	hy	0,21211	0,085353	-0,00116	-0,0013
-183	hz	0,212887	0,083796	-0,00115	-0,0013
-184	ja	0,213671	0,082243	-0,00115	-0,00131
-185	jb	0,214462	0,080693	-0,00114	-0,00132
-186	jc	0,215261	0,079147	-0,00113	-0,00132
-187	jd	0,216068	0,077606	-0,00112	-0,00133
-188	je	0,216882	0,076068	-0,00111	-0,00134
-189	jf	0,217704	0,074534	-0,00111	-0,00134
-190	jg	0,218533	0,073004	-0,0011	-0,00135
-191	jh	0,21937	0,071479	-0,00109	-0,00135
-192	jj	0,220214	0,069957	-0,00108	-0,00136
-193	jk	0,221066	0,06844	-0,00108	-0,00137
-194	jl	0,221925	0,066927	-0,00107	-0,00137
-195	jm	0,222792	0,065418	-0,00106	-0,00138
-196	jn	0,223666	0,063914	-0,00105	-0,00138
-197	jp	0,224547	0,062413	-0,00105	-0,00139
-198	jr	0,225436	0,060917	-0,00104	-0,0014
-199	js	0,226332	0,059426	-0,00103	-0,0014
-200	jt	0,227236	0,057939	-0,00102	-0,00141
-201	ju	0,228147	0,056457	-0,00102	-0,00141
-202	jv	0,229065	0,054979	-0,00101	-0,00142
-203	jw	0,22999	0,053505	-0,001	-0,00142
-204	jx	0,230923	0,052036	-0,00099	-0,00143
-205	jy	0,231863	0,050572	-0,00099	-0,00143
-206	jz	0,232811	0,049113	-0,00098	-0,00144
-207	ka	0,233765	0,047658	-0,00097	-0,00144
-208	kb	0,234727	0,046208	-0,00097	-0,00145
-209	kc	0,235696	0,044763	-0,00096	-0,00145
-210	kd	0,236672	0,043322	-0,00095	-0,00146
-211	ke	0,237655	0,041886	-0,00094	-0,00146
-212	kf	0,238645	0,040456	-0,00094	-0,00147

p	Code	u'_{BB}	v'_{BB}	$\Delta u'_{BB}$	$\Delta v'_{BB}$
-213	kg	0,239643	0,03903	-0,00093	-0,00147
-214	kh	0,240647	0,037609	-0,00092	-0,00148
-215	kj	0,241658	0,036193	-0,00092	-0,00148
-216	kk	0,242677	0,034782	-0,00091	-0,00148
-217	kl	0,243702	0,033376	-0,0009	-0,00149
-218	km	0,244734	0,031976	-0,0009	-0,00149
-219	kn	0,245773	0,03058	-0,00089	-0,0015
-220	kp	0,246819	0,029189	-0,00088	-0,0015
-221	kr	0,247872	0,027804	-0,00088	-0,0015
-222	ks	0,248931	0,026424	-0,00087	-0,00151
-223	kt	0,249998	0,025049	-0,00086	-0,00151
-224	ku	0,251071	0,023679	-0,00086	-0,00152
-225	kv	0,25215	0,022315	-0,00085	-0,00152
-226	kw	0,253237	0,020955	-0,00084	-0,00152
-227	kx	0,25433	0,019601	-0,00084	-0,00153
-228	ky	0,255429	0,018253	-0,00083	-0,00153
-229	kz	0,256535	0,01691	-0,00082	-0,00153

Bibliography

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*

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