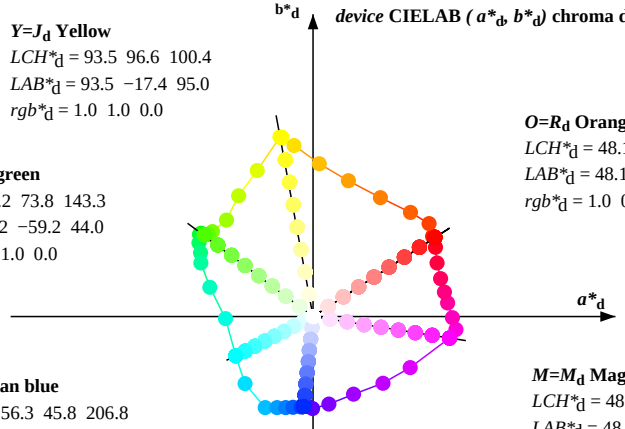
See original or copy: http://web.me.com/klaus.richter/OE29/OE29L0NA.TXT /.PS
Technical information: http://www.ps.bam.de or http://130.149.60.45/~farbmetrik

TUB registration: 20110301-OE29/OE29L0NA.TXT /.PS
application for measurement of printer or monitor systems
TUB material: code=rha4ta

Data of Maximum color M in colorimetric system laser printer HRS18_96; no separation, D65 and D50 for input or output; Six hue angles of the 60 degree standard colours *s:* $h_{ab,s}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0; Six hue angles of the device colours *d:* $h_{ab,d}$ = 32.9, 100.4, 143.4, 206.8, 264.1, 351.1; Six hue angles of the elementary colours *e:* $h_{ab,e}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6



***device* CIELAB (a^*_d, b^*_d) chroma diagram**

Y=J_d Yellow
LCH^*_d = 93.5 96.6 100.4
LAB^*_d = 93.5 −17.4 95.0
rgb^*_d = 1.0 1.0 0.0

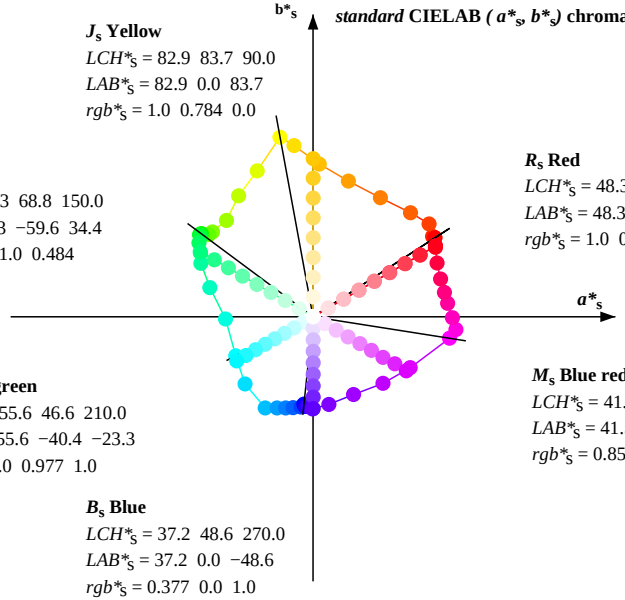
O=R_d Orange red
LCH^*_d = 48.1 76.8 32.9
LAB^*_d = 48.1 64.5 41.8
rgb^*_d = 1.0 0.0 0.0

L=G_d Leaf green
LCH^*_d = 60.2 73.8 143.3
LAB^*_d = 60.2 −59.2 44.0
rgb^*_d = 0.0 1.0 0.0

C=C_d Cyan blue
LCH^*_d = 56.3 45.8 206.8
LAB^*_d = 56.3 −40.8 −20.6
rgb^*_d = 0.0 1.0 1.0

M=M_d Magenta red
LCH^*_d = 48.2 73.0 351.0
LAB^*_d = 48.2 72.2 −11.3
rgb^*_d = 1.0 0.0 1.0

V=B_d Violet blue (very similar to elementary Blue)
LCH^*_d = 38.6 46.5 264.0
LAB^*_d = 38.6 −4.8 −46.2
rgb^*_d = 0.0 0.0 1.0



***standard* CIELAB (a^*_s, b^*_s) chroma diagram**

J_s Yellow
LCH^*_s = 82.9 83.7 90.0
LAB^*_s = 82.9 0.0 83.7
rgb^*_s = 1.0 0.784 0.0

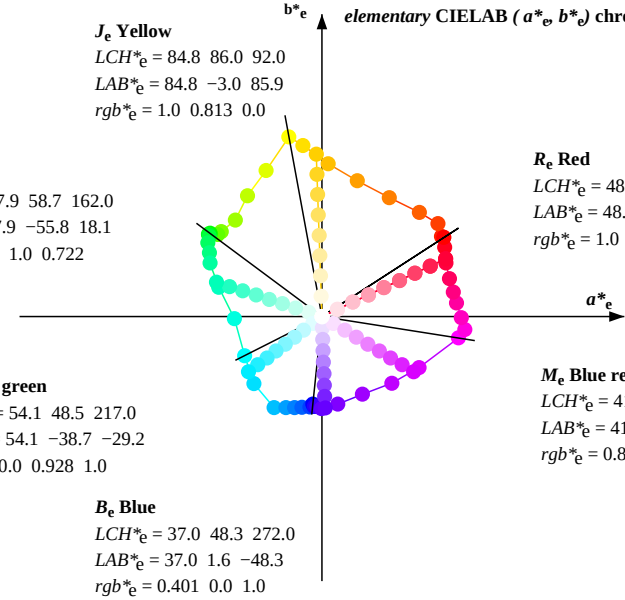
R_s Red
LCH^*_s = 48.3 74.8 30.0
LAB^*_s = 48.3 64.8 37.4
rgb^*_s = 1.0 0.0 0.106

G_s Green
LCH^*_s = 58.3 68.8 150.0
LAB^*_s = 58.3 −59.6 34.4
rgb^*_s = 0.0 1.0 0.484

C_s Blue green
LCH^*_s = 55.6 46.6 210.0
LAB^*_s = 55.6 −40.4 −23.3
rgb^*_s = 0.0 0.977 1.0

M_s Blue red
LCH^*_s = 41.5 57.0 330.0
LAB^*_s = 41.5 49.4 −28.5
rgb^*_s = 0.856 0.0 1.0

B_s Blue
LCH^*_s = 37.2 48.6 270.0
LAB^*_s = 37.2 0.0 −48.6
rgb^*_s = 0.377 0.0 1.0



***elementary* CIELAB (a^*_e, b^*_e) chroma diagram**

J_e Yellow
LCH^*_e = 84.8 86.0 92.0
LAB^*_e = 84.8 −3.0 85.9
rgb^*_e = 1.0 0.813 0.0

R_e Red
LCH^*_e = 48.2 72.2 25.0
LAB^*_e = 48.2 65.5 30.5
rgb^*_e = 1.0 0.0 0.217

G_e Green
LCH^*_e = 57.9 58.7 162.0
LAB^*_e = 57.9 −55.8 18.1
rgb^*_e = 0.0 1.0 0.722

C_e Blue green
LCH^*_e = 54.1 48.5 217.0
LAB^*_e = 54.1 −38.7 −29.2
rgb^*_e = 0.0 0.928 1.0

M_e Blue red
LCH^*_e = 41.3 56.6 329.0
LAB^*_e = 41.3 48.5 −29.1
rgb^*_e = 0.848 0.0 1.0

B_e Blue
LCH^*_e = 37.0 48.3 272.0
LAB^*_e = 37.0 1.6 −48.3
rgb^*_e = 0.401 0.0 1.0

Notes to the CIELAB chroma diagrams (a^*_d, b^*_d), (a^*_s, b^*_s), (a^*_e, b^*_e)

1. For the rgb^*_d-input values the CIELAB data LCH^*_d and LAB^*_d have been measured.
2. For the calculation of the standard hue angle $h_{ab,s}$ use for any device values rgb^*_d the equation:
   $$h_{ab,s} = atan\,[\, r^*_d\, cos(30) + g^*_d\, cos(150)\,] / [\, r^*_d\, sin(30) + g^*_d\, sin(150) + b^*_d\, sin(270)\,] \quad (1)$$
3. For the 48 or 360 equally spaced standard hue angles $h_{ab,s}$ of the colours of maximum chroma use the seven hue angles of the 60 degree colours *s:* $h_{ab,si}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0, 390.0 (i=0,6) and the equations for a 48 and 360 step hue circle:
   $$h_{48ab,sij} = h_{ab,si} + j\,[h_{ab,si+1} - h_{ab,si}\,] /8\ (\, i = 0, 1, ..., 5;\, j = 0, 1, ..., 7) \quad (2)$$
   $$h_{360ab,sij} = h_{ab,si} + j\,[h_{ab,si+1} - h_{ab,si}\,] /60\ (\, i = 0, 1, ..., 5;\, j = 0, 1, ..., 59) \quad (3)$$
4. For the 48 or 360 elementary hue angles $h_{ab,e}$ of the colours of maximum chroma use the seven hue angles of the elementary colours *e:* $h_{ab,ei}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6, 385.5 (i=0,6) and the equations for a 48 and 360 step elementary hue circle:
   $$h_{48ab,eij} = h_{ab,ei} + j\,[h_{ab,ei+1} - h_{ab,ei}\,] /8\ (\, i = 0, 1, ..., 5;\, j = 0, 1, ..., 7) \quad (4)$$
   $$h_{360ab,eij} = h_{ab,ei} + j\,[h_{ab,ei+1} - h_{ab,ei}\,] /60\ (\, i = 0, 1, ..., 5;\, j = 0, 1, ..., 59) \quad (5)$$
5. For any elementary hue angle $h_{ab,e}$ there is a well defined device hue angle $h_{ab,d}$ see the following tables, columns 1 to 3.
6. The values rgb^*_{de} produce the output of the device-independent elementary hues

TUB-test chart OE29; 48 and 360 step hue circles, Page 1/4
Data of laser printer HRS16_96, no separation, D65 and D50

input: rgb^*_d *setrgbcolor*
output: no change

Data of Maximum color M in colorimetric system laser printer HRS18_96; no separation, D65 and D50 for input or output; Six hue angles of the 60 degree standard colours *s:* $h_{ab,s}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0;
Six hue angles of the device colours *d:* $h_{ab,d}$ = 32.9, 100.4, 143.4, 206.8, 264.1, 351.1; Six hue angles of the elementary colours *e:* $h_{ab,e}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6

$h_{ab,d}$	$h_{ab,s}$	$h_{ab,e}$	*rgb**dd50M			*LAB**dd50Mx (x=LabCh)					*rgb**ds50M			*LAB**ds50Mx (x=LabCh)					*rgb**s50M			*rgb**de50M			*LAB**de50Mx (x=LabCh)					*rgb**e50M			*rgb**dd	*rgb**ds	*rgb**de
32.9	30.0	25.5	1.0	0.0	0.0	48.2	64.5	41.8	76.9	32.9	1.0	0.0	0.107	48.3	64.8	37.4	74.9	30	1.0	0.0	0.0	1.0	0.0	0.218	48.2	65.5	30.6	72.3	25	1.0	0.0	0.0			
33.9	37.5	33.8	1.0	0.125	0.0	48.9	63.3	42.5	76.2	33.9	1.0	0.233	0.0	49.8	61.7	48.2	78.3	38	1.0	0.125	0.0	1.0	0.128	0.0	48.9	63.2	42.6	76.3	34	1.0	0.125	0.0			
38.6	45.0	42.2	1.0	0.25	0.0	49.9	61.4	49.1	78.7	38.6	1.0	0.347	0.0	53.7	53.9	53.9	76.2	45	1.0	0.25	0.0	1.0	0.301	0.0	51.9	57.5	51.8	77.4	42	1.0	0.25	0.0			
46.8	52.5	50.5	1.0	0.375	0.0	54.8	51.7	55.0	75.5	46.8	1.0	0.431	0.0	58.5	44.6	59.2	74.1	53	1.0	0.375	0.0	1.0	0.413	0.0	57.3	46.9	57.9	74.5	51	1.0	0.375	0.0			
60.6	60.0	58.9	1.0	0.5	0.0	63.1	35.6	63.0	72.3	60.6	1.0	0.495	0.0	62.7	36.2	62.8	72.5	60	1.0	0.5	0.0	1.0	0.486	0.0	62.1	37.4	62.3	72.7	59	1.0	0.5	0.0			
75.4	67.5	67.2	1.0	0.625	0.0	72.0	18.7	71.8	74.2	75.4	1.0	0.563	0.0	67.6	27.5	67.9	73.3	68	1.0	0.625	0.0	1.0	0.554	0.0	67.0	28.6	67.3	73.2	67	1.0	0.625	0.0			
87.6	75.0	75.6	1.0	0.75	0.0	80.7	3.3	80.9	80.9	87.6	1.0	0.621	0.0	71.8	19.2	71.6	74.2	75	1.0	0.75	0.0	1.0	0.631	0.0	72.5	18.0	72.3	74.5	76	1.0	0.75	0.0			
96.3	82.5	84.0	1.0	0.875	0.0	88.8	−9.9	90.5	91.1	96.3	1.0	0.703	0.0	77.4	9.6	77.8	78.4	83	1.0	0.875	0.0	1.0	0.713	0.0	78.1	8.3	78.5	78.9	84	1.0	0.875	0.0			
100.4	90.0	92.3	1.0	1.0	0.0	93.5	−17.4	95.1	96.7	100.4	1.0	0.784	0.0	82.9	0.0	83.7	83.7	90	1.0	1.0	0.0	1.0	0.813	0.0	84.8	−2.9	86.0	86.0	92	1.0	1.0	0.0			
110.9	97.5	101.1	0.875	1.0	0.0	82.4	−29.5	77.3	82.7	110.9	1.0	0.927	0.0	90.8	−12.9	92.5	93.4	98	0.875	1.0	0.0	0.993	1.0	0.0	92.9	−18.2	94.1	95.9	101	0.875	1.0	0.0			
121.6	105.0	109.8	0.75	1.0	0.0	74.0	−39.3	64.0	75.1	121.6	0.945	1.0	0.0	88.6	−23.3	87.5	90.6	105	0.75	1.0	0.0	0.886	1.0	0.0	83.4	−28.6	78.9	84.0	110	0.75	1.0	0.0			
131.9	112.5	118.5	0.625	1.0	0.0	67.2	−45.7	51.1	68.6	131.9	0.851	1.0	0.0	80.8	−31.6	74.8	81.3	113	0.625	1.0	0.0	0.78	1.0	0.0	76.0	−37.2	67.3	77.0	119	0.625	1.0	0.0			
139.8	120.0	127.3	0.5	1.0	0.0	62.1	−53.1	45.0	69.7	139.8	0.769	1.0	0.0	75.3	−38.0	66.1	76.3	120	0.5	1.0	0.0	0.685	1.0	0.0	70.4	−43.1	57.3	71.7	127	0.5	1.0	0.0			
141.7	127.5	136.0	0.375	1.0	0.0	61.2	−55.0	43.5	70.2	141.7	0.672	1.0	0.0	69.8	−43.7	56.0	71.1	128	0.375	1.0	0.0	0.56	1.0	0.0	64.5	−49.7	48.0	69.2	136	0.375	1.0	0.0			
143.8	135.0	144.7	0.25	1.0	0.0	60.1	−58.8	43.2	73.1	143.8	0.576	1.0	0.0	65.2	−48.7	48.8	69.0	135	0.25	1.0	0.0	0.0	1.0	0.273	59.5	−59.5	41.8	72.8	145	0.25	1.0	0.0			
144.1	142.5	153.5	0.125	1.0	0.0	59.7	−59.7	43.3	73.8	144.1	0.297	1.0	0.0	60.5	−57.4	43.3	72.0	143	0.125	1.0	0.0	0.0	1.0	0.579	57.8	−59.3	30.3	66.7	153	0.125	1.0	0.0			
143.4	150.0	162.2	0.0	1.0	0.0	60.3	−59.2	44.1	73.9	143.4	0.0	1.0	0.485	58.3	−59.5	34.4	68.9	150	0.0	1.0	0.0	0.0	1.0	0.722	57.9	−55.8	18.1	58.7	162	0.0	1.0	0.0			
144.0	157.5	169.1	0.0	1.0	0.125	59.6	−59.9	43.5	74.1	144.0	0.0	1.0	0.67	57.7	−57.8	23.4	62.4	158	0.0	1.0	0.125	0.0	1.0	0.785	58.5	−52.7	10.3	53.8	169	0.0	1.0	0.125			
144.5	165.0	175.9	0.0	1.0	0.25	59.7	−59.4	42.4	73.0	144.5	0.0	1.0	0.756	58.1	−54.2	14.6	56.2	165	0.0	1.0	0.25	0.0	1.0	0.836	59.2	−49.3	3.5	49.6	176	0.0	1.0	0.25			
147.1	172.5	182.8	0.0	1.0	0.375	58.6	−60.2	39.1	71.9	147.1	0.0	1.0	0.814	58.9	−50.9	6.3	51.4	173	0.0	1.0	0.375	0.0	1.0	0.883	59.5	−46.1	−2.3	46.3	183	0.0	1.0	0.375			
150.4	180.0	189.6	0.0	1.0	0.5	58.3	−59.4	33.8	68.5	150.4	0.0	1.0	0.865	59.6	−47.1	0.0	47.2	180	0.0	1.0	0.5	0.0	1.0	0.917	58.6	−45.3	−7.9	45.9	190	0.0	1.0	0.5			
154.5	187.5	196.4	0.0	1.0	0.625	57.6	−59.2	28.3	65.7	154.5	0.0	1.0	0.908	58.9	−45.6	−6.3	46.2	188	0.0	1.0	0.625	0.0	1.0	0.947	57.8	−44.1	−12.0	45.7	196	0.0	1.0	0.625			
164.1	195.0	203.3	0.0	1.0	0.75	58.1	−54.5	15.5	56.7	164.1	0.0	1.0	0.942	57.9	−44.4	−11.8	46.1	195	0.0	1.0	0.75	0.0	1.0	0.981	56.8	−42.1	−17.8	45.9	203	0.0	1.0	0.75			
181.4	202.5	210.1	0.0	1.0	0.875	59.7	−46.2	−1.0	46.3	181.4	0.0	1.0	0.981	56.8	−42.1	−17.8	45.9	203	0.0	1.0	0.875	0.0	0.978	1.0	55.6	−40.9	−23.2	46.7	210	0.0	1.0	0.875			
206.8	210.0	217.0	0.0	1.0	1.0	56.3	−40.8	−20.6	45.8	206.8	0.0	0.978	1.0	55.6	−40.3	−23.2	46.7	210	0.0	1.0	1.0	0.0	0.928	1.0	54.1	−38.7	−29.1	48.6	217	0.0	1.0	1.0			
224.6	217.5	223.8	0.0	0.875	1.0	52.5	−35.9	−35.4	50.6	224.6	0.0	0.921	1.0	53.9	−38.4	−30.0	48.8	218	0.0	0.875	1.0	0.0	0.879	1.0	52.6	−36.2	−34.9	50.4	224	0.0	0.875	1.0			
242.3	225.0	230.7	0.0	0.75	1.0	51.3	−25.2	−48.1	54.5	242.3	0.0	0.872	1.0	52.5	−35.7	−35.7	50.7	225	0.0	0.75	1.0	0.0	0.83	1.0	52.0	−32.6	−40.3	52.0	231	0.0	0.75	1.0			
248.4	232.5	237.5	0.0	0.625	1.0	48.1	−19.0	−48.1	51.8	248.4	0.0	0.815	1.0	51.9	−31.5	−41.8	52.4	233	0.0	0.625	1.0	0.0	0.78	1.0	51.6	−28.3	−45.3	53.5	238	0.0	0.625	1.0			
253.2	240.0	244.4	0.0	0.5	1.0	45.5	−14.5	−48.1	50.3	253.2	0.0	0.766	1.0	51.4	−26.9	−46.6	54.0	240	0.0	0.5	1.0	0.0	0.715	1.0	50.4	−23.4	−48.2	53.7	244	0.0	0.5	1.0			
257.6	247.5	251.2	0.0	0.375	1.0	43.1	−10.5	−47.9	49.2	257.6	0.0	0.634	1.0	48.4	−19.4	−48.1	52.0	248	0.0	0.375	1.0	0.0	0.557	1.0	46.7	−16.5	−48.1	51.0	251	0.0	0.375	1.0			
262.3	255.0	258.0	0.0	0.25	1.0	41.2	−6.3	−47.7	48.2	262.3	0.0	0.448	1.0	44.5	−12.8	−48.1	49.9	255	0.0	0.25	1.0	0.0	0.364	1.0	42.9	−10.1	−47.9	49.1	258	0.0	0.25	1.0			
264.8	262.5	264.9	0.0	0.125	1.0	39.8	−4.2	−47.4	47.7	264.8	0.0	0.215	1.0	40.8	−5.8	−47.6	48.0	263	0.0	0.125	1.0	0.0	0.106	0.0	1.0	39.1	−4.0	−47.1	47.4	265	0.0	0.125	1.0			
264.1	270.0	271.7	0.0	0.0	1.0	38.7	−4.7	−46.2	46.5	264.1	0.378	0.0	1.0	37.2	0.0	−48.6	48.7	270	0.0	0.0	1.0	0.402	0.0	1.0	37.0	1.7	−48.2	48.4	272	0.0	0.0	1.0			
265.2	277.5	278.8	0.125	0.0	1.0	39.2	−3.9	−47.3	47.6	265.2	0.473	0.0	1.0	36.4	6.6	−46.9	47.4	278	0.125	0.0	1.0	0.485	0.0	1.0	36.3	7.4	−46.6	47.3	279	0.125	0.0	1.0			
266.9	285.0	286.0	0.25	0.0	1.0	38.9	−2.5	−47.3	47.5	266.9	0.535	0.0	1.0	36.3	12.1	−45.1	46.9	285	0.25	0.0	1.0	0.542	0.0	1.0	36.4	12.9	−44.9	46.9	286	0.25	0.0	1.0			
269.8	292.5	293.1	0.375	0.0	1.0	37.3	−0.1	−48.6	48.7	269.8	0.592	0.0	1.0	36.7	18.2	−42.8	46.6	293	0.375	0.0	1.0	0.592	0.0	1.0	36.7	18.2	−42.8	46.6	293	0.375	0.0	1.0			
280.2	300.0	300.2	0.5	0.0	1.0	36.2	8.4	−46.2	47.1	280.2	0.642	0.0	1.0	37.1	23.5	−40.6	47.0	300	0.5	0.0	1.0	0.642	0.0	1.0	37.1	23.5	−40.6	47.0	300	0.5	0.0	1.0			
297.5	307.5	307.3	0.625	0.0	1.0	36.8	21.4	−41.0	46.4	297.5	0.694	0.0	1.0	38.0	30.2	−38.5	49.0	308	0.625	0.0	1.0	0.688	0.0	1.0	37.9	29.3	−38.8	48.8	307	0.625	0.0	1.0			
316.4	315.0	314.4	0.75	0.0	1.0	39.0	37.0	−35.1	51.1	316.4	0.741	0.0	1.0	40.0	35.9	−35.3	50.7	315	0.75	0.0	1.0	0.734	0.0	1.0	38.7	35.1	−36.2	50.5	314	0.75	0.0	1.0			
332.3	322.5	321.5	0.875	0.0	1.0	42.0	51.4	−26.9	58.1	332.3	0.802	0.0	1.0	40.2	43.2	−32.4	54.0	323	0.875	0.0	1.0	0.786	0.0	1.0	39.8	41.3	−33.3	53.1	321	0.875	0.0	1.0			
351.1	330.0	328.6	1.0	0.0	1.0	48.2	72.2	−11.3	73.1	351.1	0.857	0.0	1.0	41.6	49.4	−28.4	57.1	330	1.0	0.0	1.0	0.849	0.0	1.0	41.3	48.5	−29.1	56.6	329	1.0	0.0	1.0			
354.9	337.5	335.7	1.0	0.0	0.875	48.3	75.6	−6.7	75.9	354.9	0.9	0.0	1.0	43.9	58.1	−25.1	62.6	338	1.0	0.0	0.875	0.899	0.0	1.0	43.2	55.7	−24.7	61.0	336	1.0	0.0	0.875			
359.6	345.0	342.8	1.0	0.0	0.75	47.9	73.8	−0.5	73.8	359.6	0.96	0.0	1.0	46.2	65.6	−17.6	68.2	345	1.0	0.0	0.75	0.946	0.0	1.0	45.5	63.7	−19.4	66.6	343	1.0	0.0	0.75			
365.8	352.5	349.9	1.0	0.0	0.625	48.1	71.2	7.2	71.6	365.8	1.0	0.0	0.937	48.2	68.9	−9.0	74.5	353	1.0	0.0	0.625	0.993	0.0	1.0	47.9	71.2	−12.4	72.3	350	1.0	0.0	0.625			
370.5	360.0	357.0	1.0	0.0	0.5	48.3	69.4	12.9	70.6	370.5	1.0	1.0	0.741	48.2	73.6	0.0	73.6	0	1.0	0.0	0.5	1.0	0.0	0.818	48.1	74.8	−3.8	74.9	357	1.0	0.0	0.5			
376.6	367.5	364.2	1.0	0.0	0.375	47.9	67.4	20.1	70.3	376.6	1.0	0.0	0.536	48.2	70.4	9.9	71.1	8	1.0	0.0	0.375	1.0	0.0	0.66	48.0	72.0	5.0	72.2	4	1.0	0.0	0.375			
383.4	375.0	371.3	1.0	0.0	0.25	48.2	65.6	28.5	71.5	383.4	1.0	0.0	0.407	48.0	68.0	18.2	70.4	15	1.0	0.0	0.25	1.0	0.0	0.49	48.2	69.3	13.5	70.6	11	1.0	0.0	0.25			
389.5	382.5	378.4	1.0	0.0	0.125	48.3	64.9	36.7	74.5	389.5	1.0	0.0	0.258	48.1	65.8	27.9	71.4	23	1.0	0.0	0.125	1.0	0.0	0.349	48.0	67.1	21.8	70.6	18	1.0	0.0	0.125			
392.9	390.0	385.5	1.0	0.0	0.0	48.2	64.5	41.8	76.9	392.9	1.0	0.0	0.107	48.3	64.8	37.4	74.9	30	1.0	0.0	0.0	1.0	0.0	0.218	48.2	65.5	30.6	72.3	25	1.0	0.0	0.0			

no continues hue change of device near $h_{ab,d}$ = 144,264
or *rgbd* = 0.125, 1.0, 0.0; 0.0, 0.125, 1.0**
no correction done

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TUB registration: 20110301-OE29/OE29L0NA.TXT /.PS
application for measurement of printer or monitor systems
TUB material: code=rha4ta

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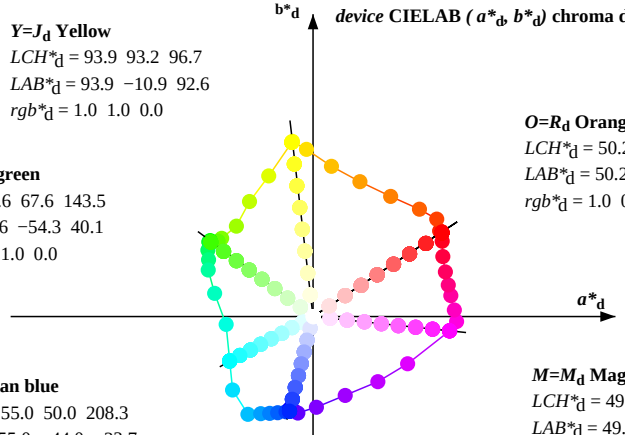
Technical information: http://www.ps.bam.de or http://130.149.60.45/~farbmetrik

TUB registration: 20110301-OE29/OE29L0NA.TXT /.PS
application for measurement of printer or monitor systems
TUB material: code=rha4ta

Data of Maximum color M in colorimetric system laser printer HRS18_96; no separation, D65 and D50 for input or output; Six hue angles of the 60 degree standard colours *s:* $h_{ab,s}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0; Six hue angles of the device colours *d:* $h_{ab,d}$ = 33.3, 96.7, 143.6, 208.3, 255.8, 354.0; Six hue angles of the elementary colours *e:* $h_{ab,e}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6



***device* CIELAB (a^*_d, b^*_d) chroma diagram**

***Y*=J_d Yellow**
*LCH**d = 93.9 93.2 96.7
*LAB**d = 93.9 −10.9 92.6
*rgb**d = 1.0 1.0 0.0

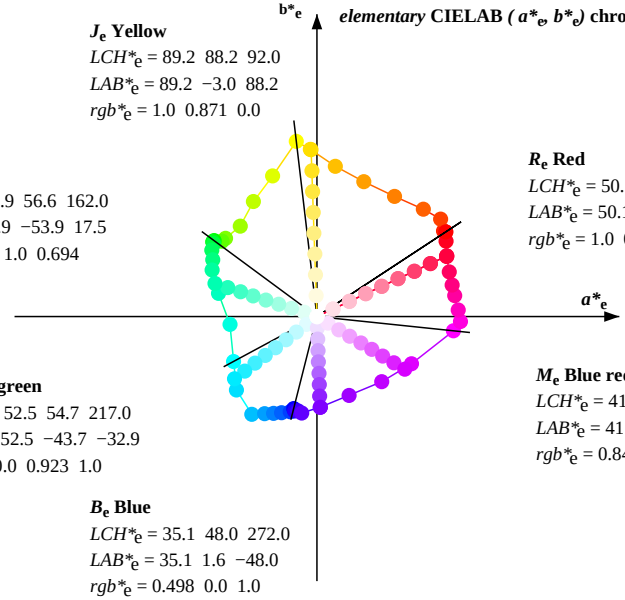
***O*=R_d Orange red**
*LCH**d = 50.2 81.4 33.3
*LAB**d = 50.2 68.0 44.7
*rgb**d = 1.0 0.0 0.0

***L*=G_d Leaf green**
*LCH**d = 59.6 67.6 143.5
*LAB**d = 59.6 −54.3 40.1
*rgb**d = 0.0 1.0 0.0

***C*=C_d Cyan blue**
*LCH**d = 55.0 50.0 208.3
*LAB**d = 55.0 −44.0 −23.7
*rgb**d = 0.0 1.0 1.0

***M*=M_d Magenta red**
*LCH**d = 49.9 72.6 354.0
*LAB**d = 49.9 72.2 −7.5
*rgb**d = 1.0 0.0 1.0

***V*=B_d Violet blue (very similar to elementary Blue)**
*LCH**d = 37.3 50.2 255.8
*LAB**d = 37.3 −12.3 −48.7
*rgb**d = 0.0 0.0 1.0



***elementary* CIELAB (a^*_e, b^*_e) chroma diagram**

J_e Yellow
*LCH**e = 89.2 88.2 92.0
*LAB**e = 89.2 −3.0 88.2
*rgb**e = 1.0 0.871 0.0

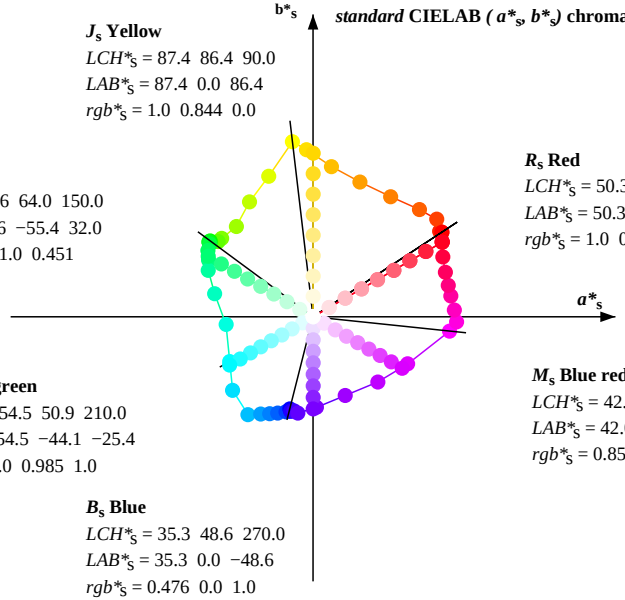
G_e Green
*LCH**e = 56.9 56.6 162.0
*LAB**e = 56.9 −53.9 17.5
*rgb**e = 0.0 1.0 0.694

R_e Red
*LCH**e = 50.1 75.7 25.0
*LAB**e = 50.1 68.6 32.0
*rgb**e = 1.0 0.0 0.246

C_e Blue green
*LCH**e = 52.5 54.7 217.0
*LAB**e = 52.5 −43.7 −32.9
*rgb**e = 0.0 0.923 1.0

M_e Blue red
*LCH**e = 41.8 54.1 329.0
*LAB**e = 41.8 46.4 −27.9
*rgb**e = 0.844 0.0 1.0

B_e Blue
*LCH**e = 35.1 48.0 272.0
*LAB**e = 35.1 1.6 −48.0
*rgb**e = 0.498 0.0 1.0



***standard* CIELAB (a^*_s, b^*_s) chroma diagram**

J_s Yellow
*LCH**s = 87.4 86.4 90.0
*LAB**s = 87.4 0.0 86.4
*rgb**s = 1.0 0.844 0.0

G_s Green
*LCH**s = 57.6 64.0 150.0
*LAB**s = 57.6 −55.4 32.0
*rgb**s = 0.0 1.0 0.451

R_s Red
*LCH**s = 50.3 78.8 30.0
*LAB**s = 50.3 68.3 39.4
*rgb**s = 1.0 0.0 0.13

C_s Blue green
*LCH**s = 54.5 50.9 210.0
*LAB**s = 54.5 −44.1 −25.4
*rgb**s = 0.0 0.985 1.0

M_s Blue red
*LCH**s = 42.0 54.5 330.0
*LAB**s = 42.0 47.2 −27.2
*rgb**s = 0.851 0.0 1.0

B_s Blue
*LCH**s = 35.3 48.6 270.0
*LAB**s = 35.3 0.0 −48.6
*rgb**s = 0.476 0.0 1.0

Notes to the CIELAB chroma diagrams (a^*_d, b^*_d), (a^*_s, b^*_s), (a^*_e, b^*_e)

1. For the *rgb**d-input values the CIELAB data *LCH**d and *LAB**d have been measured.
2. For the calculation of the standard hue angle $h_{ab,s}$ use for any device values *rgb**d the equation:
   $$h_{ab,s} = atan\,[\,r^*_d\,cos(30) + g^*_d\,cos(150)\,] / [\,r^*_d\,sin(30) + g^*_d\,sin(150) + b^*_d\,sin(270)\,] \quad (1)$$
3. For the 48 or 360 equally spaced standard hue angles $h_{ab,s}$ of the colours of maximum chroma use the seven hue angles of the 60 degree colours *s:* $h_{ab,si}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0, 390.0 (i=0,6) and the equations for a 48 and 360 step hue circle:
   $$h_{48ab,sij} = h_{ab,si} + j\,[h_{ab,si+1} - h_{ab,si}\,]/8\;(\,i = 0, 1, ..., 5;\, j = 0, 1, ..., 7) \quad (2)$$
   $$h_{360ab,sij} = h_{ab,si} + j\,[h_{ab,si+1} - h_{ab,si}\,]/60\;(\,i = 0, 1, ..., 5;\, j = 0, 1, ..., 59) \quad (3)$$
4. For the 48 or 360 elementary hue angles $h_{ab,e}$ of the colours of maximum chroma use the seven hue angles of the elementary colours *e:* $h_{ab,ei}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6, 385.5 (i=0,6) and the equations for a 48 and 360 step elementary hue circle:
   $$h_{48ab,eij} = h_{ab,ei} + j\,[h_{ab,ei+1} - h_{ab,ei}\,]/8\;(\,i = 0, 1, ..., 5;\, j = 0, 1, ..., 7) \quad (4)$$
   $$h_{360ab,eij} = h_{ab,ei} + j\,[h_{ab,ei+1} - h_{ab,ei}\,]/60\;(\,i = 0, 1, ..., 5;\, j = 0, 1, ..., 59) \quad (5)$$
5. For any elementary hue angle $h_{ab,e}$ there is a well defined device hue angle $h_{ab,d}$ see the following tables, columns 1 to 3.
6. The values *rgb**de produce the output of the device-independent elementary hues

Data of Maximum color M in colorimetric system laser printer HRS18_96; no separation, D65 and D50 for input or output; Six hue angles of the 60 degree standard colours *s:* $h_{ab,s}$ = 30.0, 90.0, 150.0, 210.0, 270.0, 330.0;
Six hue angles of the device colours *d:* $h_{ab,d}$ = 33.3, 96.7, 143.6, 208.3, 255.8, 354.0; Six hue angles of the elementary colours *e:* $h_{ab,e}$ = 25.5, 92.3, 162.2, 217.0, 271.7, 328.6

$h_{ab,d}$	$h_{ab,s}$	$h_{ab,e}$	*rgb**dd50M			*LAB**dd50Mx (x=LabCh)					*rgb**ds50M			*LAB**ds50Mx (x=LabCh)					*rgb**s50M			*rgb**de50M			*LAB**de50Mx (x=LabCh)					*rgb**e50M		
33.3	30.0	25.5	1.0	0.0	0.0	50.2	68.1	44.7	81.5	33.3	1.0	0.0	0.13	50.3	68.3	39.4	78.9	30	1.0	0.0	0.0	1.0	0.0	0.246	50.1	68.7	32.0	75.8	25	1.0	0.0	0.0
34.1	37.5	33.8	1.0	0.125	0.0	50.9	66.9	45.3	80.8	34.1	1.0	0.242	0.0	51.8	65.5	51.2	83.2	38	1.0	0.125	0.0	1.0	0.113	0.0	50.8	67.1	45.2	80.9	34	1.0	0.125	0.0
38.3	45.0	42.2	1.0	0.25	0.0	51.8	65.4	51.6	83.3	38.3	1.0	0.371	0.0	56.4	56.6	56.6	80.1	45	1.0	0.25	0.0	1.0	0.317	0.0	54.4	60.6	54.5	81.5	42	1.0	0.25	0.0
45.2	52.5	50.5	1.0	0.375	0.0	56.5	56.3	56.7	79.9	45.2	1.0	0.457	0.0	61.7	46.4	61.6	77.2	53	1.0	0.375	0.0	1.0	0.436	0.0	60.3	49.0	60.5	77.9	51	1.0	0.375	0.0
57.1	60.0	58.9	1.0	0.5	0.0	64.4	41.1	63.6	75.7	57.1	1.0	0.526	0.0	66.2	37.8	65.5	75.7	60	1.0	0.5	0.0	1.0	0.517	0.0	65.6	39.0	64.9	75.7	59	1.0	0.5	0.0
70.9	67.5	67.2	1.0	0.625	0.0	73.1	24.8	71.4	75.6	70.9	1.0	0.599	0.0	71.3	28.3	70.1	75.6	68	1.0	0.625	0.0	1.0	0.59	0.0	70.6	29.5	69.6	75.6	67	1.0	0.625	0.0
83.0	75.0	75.6	1.0	0.75	0.0	81.5	9.7	79.5	80.1	83.0	1.0	0.667	0.0	75.9	20.0	74.5	77.1	75	1.0	0.75	0.0	1.0	0.678	0.0	76.6	18.7	75.2	77.5	76	1.0	0.75	0.0
92.2	82.5	84.0	1.0	0.875	0.0	89.4	−3.3	88.4	88.5	92.2	1.0	0.75	0.0	81.5	9.8	79.5	80.1	83	1.0	0.875	0.0	1.0	0.763	0.0	82.3	8.5	80.6	81.0	84	1.0	0.875	0.0
96.7	90.0	92.3	1.0	1.0	0.0	94.0	−10.8	92.6	93.3	96.7	1.0	0.845	0.0	87.5	0.0	86.5	86.5	90	1.0	1.0	0.0	1.0	0.872	0.0	89.2	−3.0	88.2	88.3	92	1.0	1.0	0.0
107.5	97.5	101.1	0.875	1.0	0.0	82.5	−23.3	74.4	78.0	107.5	0.985	1.0	0.0	92.6	−12.6	90.6	91.5	98	0.875	1.0	0.0	0.95	1.0	0.0	89.4	−16.5	85.6	87.2	101	0.875	1.0	0.0
118.9	105.0	109.8	0.75	1.0	0.0	73.8	−33.5	60.8	69.5	118.9	0.904	1.0	0.0	85.1	−21.0	78.7	81.5	105	0.75	1.0	0.0	0.847	1.0	0.0	80.6	−25.9	71.5	76.1	110	0.75	1.0	0.0
130.4	112.5	118.5	0.625	1.0	0.0	66.8	−40.5	47.8	62.7	130.4	0.815	1.0	0.0	78.3	−28.8	68.0	73.9	113	0.625	1.0	0.0	0.749	1.0	0.0	73.8	−33.6	60.7	69.4	119	0.625	1.0	0.0
139.4	120.0	127.3	0.5	1.0	0.0	61.5	−48.2	41.4	63.6	139.4	0.738	1.0	0.0	73.2	−34.3	59.6	68.8	120	0.5	1.0	0.0	0.662	1.0	0.0	68.9	−38.8	51.7	64.7	127	0.5	1.0	0.0
141.6	127.5	136.0	0.375	1.0	0.0	60.6	−50.2	39.8	64.1	141.6	0.651	1.0	0.0	68.3	−39.4	50.5	64.1	128	0.375	1.0	0.0	0.547	1.0	0.0	63.5	−45.4	44.0	63.3	136	0.375	1.0	0.0
144.0	135.0	144.7	0.25	1.0	0.0	59.4	−54.0	39.3	66.9	144.0	0.561	1.0	0.0	64.1	−44.6	44.7	63.2	135	0.25	1.0	0.0	0.0	1.0	0.256	59.0	−54.6	38.3	66.8	145	0.25	1.0	0.0
144.4	142.5	153.5	0.125	1.0	0.0	59.0	−54.9	39.4	67.6	144.4	0.301	1.0	0.0	59.9	−52.4	39.6	65.8	143	0.125	1.0	0.0	0.0	1.0	0.542	57.3	−55.3	28.2	62.1	153	0.125	1.0	0.0
143.6	150.0	162.2	0.0	1.0	0.0	59.6	−54.3	40.2	67.6	143.6	0.0	1.0	0.452	57.7	−55.4	32.0	64.0	150	0.0	1.0	0.0	0.0	1.0	0.694	57.0	−53.8	17.5	56.7	162	0.0	1.0	0.0
144.3	157.5	169.1	0.0	1.0	0.125	59.0	−55.0	39.6	67.8	144.3	0.0	1.0	0.648	56.8	−54.9	22.2	59.4	158	0.0	1.0	0.125	0.0	1.0	0.765	57.4	−51.5	10.0	52.6	169	0.0	1.0	0.125
144.9	165.0	175.9	0.0	1.0	0.25	59.0	−54.6	38.5	66.8	144.9	0.0	1.0	0.729	57.1	−52.7	14.2	54.7	165	0.0	1.0	0.25	0.0	1.0	0.813	58.0	−49.6	3.5	49.8	176	0.0	1.0	0.25
147.7	172.5	182.8	0.0	1.0	0.375	57.9	−55.6	35.2	65.9	147.7	0.0	1.0	0.793	57.7	−50.5	6.2	51.0	173	0.0	1.0	0.375	0.0	1.0	0.861	58.6	−46.9	−2.4	47.0	183	0.0	1.0	0.375
151.4	180.0	189.6	0.0	1.0	0.5	57.5	−55.1	30.1	62.9	151.4	0.0	1.0	0.841	58.3	−48.1	0.0	48.2	180	0.0	1.0	0.5	0.0	1.0	0.902	58.0	−46.2	−8.1	47.0	190	0.0	1.0	0.5
156.1	187.5	196.4	0.0	1.0	0.625	56.8	−55.3	24.6	60.7	156.1	0.0	1.0	0.891	58.3	−46.2	−6.4	46.7	188	0.0	1.0	0.625	0.0	1.0	0.934	57.0	−46.1	−13.2	48.0	196	0.0	1.0	0.625
166.8	195.0	203.3	0.0	1.0	0.75	57.2	−52.0	12.2	53.5	166.8	0.0	1.0	0.929	57.2	−46.1	−12.3	47.9	195	0.0	1.0	0.75	0.0	1.0	0.971	55.9	−45.2	−19.1	49.2	203	0.0	1.0	0.75
185.0	202.5	210.1	0.0	1.0	0.875	58.8	−45.9	−4.0	46.2	185.0	0.0	1.0	0.971	55.9	−45.2	−19.1	49.2	203	0.0	1.0	0.875	0.0	0.985	1.0	54.6	−44.0	−25.4	51.0	210	0.0	1.0	0.875
208.3	210.0	217.0	0.0	1.0	1.0	55.1	−44.0	−23.6	50.1	208.3	0.0	0.985	1.0	54.6	−44.0	−25.4	51.0	210	0.0	1.0	1.0	0.0	0.923	1.0	52.5	−43.6	−32.8	54.7	217	0.0	1.0	1.0
222.4	217.5	223.8	0.0	0.875	1.0	50.9	−42.4	−38.8	57.6	222.4	0.0	0.914	1.0	52.2	−43.4	−33.9	55.3	218	0.0	0.875	1.0	0.0	0.861	1.0	50.8	−41.7	−40.3	58.1	224	0.0	0.875	1.0
236.4	225.0	230.7	0.0	0.75	1.0	49.6	−34.3	−51.6	62.1	236.4	0.0	0.852	1.0	50.7	−41.2	−41.2	58.5	225	0.0	0.75	1.0	0.0	0.797	1.0	50.1	−37.9	−46.8	60.4	231	0.0	0.75	1.0
241.6	232.5	237.5	0.0	0.625	1.0	46.5	−27.7	−51.3	58.4	241.6	0.0	0.78	1.0	49.9	−36.6	−48.6	61.0	233	0.0	0.625	1.0	0.0	0.712	1.0	48.6	−32.2	−51.6	61.0	238	0.0	0.625	1.0
245.8	240.0	244.4	0.0	0.5	1.0	43.9	−22.9	−51.1	56.1	245.8	0.0	0.664	1.0	47.5	−29.7	−51.5	59.6	240	0.0	0.5	1.0	0.0	0.554	1.0	45.1	−24.9	−51.2	57.1	244	0.0	0.5	1.0
249.8	247.5	251.2	0.0	0.375	1.0	41.6	−18.6	−50.7	54.2	249.8	0.0	0.432	1.0	42.7	−20.5	−50.9	55.1	248	0.0	0.375	1.0	0.0	0.311	1.0	41.1	−17.4	−50.7	53.7	251	0.0	0.375	1.0
254.2	255.0	258.0	0.0	0.25	1.0	39.8	−14.2	−50.3	52.3	254.2	0.0	0.207	1.0	39.4	−13.4	−50.1	52.0	255	0.0	0.25	1.0	0.213	0.0	1.0	37.7	−10.5	−49.7	50.9	258	0.0	0.25	1.0
256.5	262.5	264.9	0.0	0.125	1.0	38.5	−11.9	−49.8	51.3	256.5	0.397	0.0	1.0	35.8	−6.1	−50.5	51.0	263	0.0	0.125	1.0	0.42	0.0	1.0	35.7	−4.3	−50.0	50.3	265	0.0	0.125	1.0
255.8	270.0	271.7	0.0	0.0	1.0	37.4	−12.2	−48.6	50.3	255.8	0.476	0.0	1.0	35.3	0.0	−48.6	48.7	270	0.0	0.0	1.0	0.499	0.0	1.0	35.2	1.7	−47.9	48.0	272	0.0	0.0	1.0
256.8	277.5	278.8	0.125	0.0	1.0	37.9	−11.6	−49.8	51.2	256.8	0.537	0.0	1.0	35.5	6.6	−46.6	47.1	277	0.125	0.0	1.0	0.543	0.0	1.0	35.6	7.3	−46.3	47.0	279	0.125	0.0	1.0
258.5	285.0	286.0	0.25	0.0	1.0	37.7	−10.0	−49.7	50.8	258.5	0.58	0.0	1.0	35.9	11.9	−44.4	46.0	285	0.25	0.0	1.0	0.586	0.0	1.0	36.0	12.7	−44.0	45.9	286	0.25	0.0	1.0
261.0	292.5	293.1	0.375	0.0	1.0	36.0	−8.0	−50.9	51.7	261.0	0.63	0.0	1.0	36.5	17.6	−41.6	45.1	293	0.375	0.0	1.0	0.63	0.0	1.0	36.5	17.6	−41.4	45.1	293	0.375	0.0	1.0
272.1	300.0	300.2	0.5	0.0	1.0	35.2	1.8	−47.9	48.0	272.1	0.668	0.0	1.0	37.3	23.1	−40.0	46.2	300	0.5	0.0	1.0	0.668	0.0	1.0	37.3	23.1	−40.0	46.2	300	0.5	0.0	1.0
292.2	307.5	307.3	0.625	0.0	1.0	36.4	17.0	−41.6	45.0	292.2	0.712	0.0	1.0	38.3	29.3	−37.4	47.5	308	0.625	0.0	1.0	0.707	0.0	1.0	38.2	28.5	−37.7	47.4	307	0.625	0.0	1.0
314.9	315.0	314.4	0.75	0.0	1.0	39.1	34.3	−34.4	48.6	314.9	0.751	0.0	1.0	40.1	34.4	−34.3	48.7	315	0.75	0.0	1.0	0.745	0.0	1.0	39.0	33.7	−34.8	48.5	314	0.75	0.0	1.0
333.5	322.5	321.5	0.875	0.0	1.0	42.7	50.1	−24.9	56.0	333.5	0.804	0.0	1.0	40.7	41.2	−31.1	51.8	323	0.875	0.0	1.0	0.791	0.0	1.0	40.3	39.7	−32.0	51.0	321	0.875	0.0	1.0
354.0	330.0	328.6	1.0	0.0	1.0	50.0	72.3	−7.4	72.7	354.0	0.851	0.0	1.0	42.0	47.3	−27.2	54.6	330	1.0	0.0	1.0	0.845	0.0	1.0	41.9	46.4	−27.8	54.2	329	1.0	0.0	1.0
358.0	337.5	335.7	1.0	0.0	0.875	50.1	76.0	−2.5	76.0	358.0	0.9	0.0	1.0	44.3	55.3	−23.1	59.6	338	1.0	0.0	0.875	0.89	0.0	1.0	43.6	53.0	−23.5	58.0	336	1.0	0.0	0.875
362.7	345.0	342.8	1.0	0.0	0.75	49.8	74.7	3.5	74.8	362.7	0.945	0.0	1.0	46.8	63.4	−16.8	65.3	345	1.0	0.0	0.75	0.933	0.0	1.0	46.1	60.9	−18.5	63.7	343	1.0	0.0	0.75
368.6	352.5	349.9	1.0	0.0	0.625	50.0	72.8	11.1	73.7	368.6	0.994	0.0	1.0	49.6	71.3	−8.7	71.8	353	1.0	0.0	0.625	0.975	0.0	1.0	48.5	68.3	−11.9	69.4	350	1.0	0.0	0.625
373.1	360.0	357.0	1.0	0.0	0.5	50.2	71.5	16.6	73.5	373.1	1.0	0.0	0.822	50.0	75.5	0.0	75.5	0	1.0	0.0	0.5	1.0	0.0	0.907	50.1	75.0	−3.8	75.2	357	1.0	0.0	0.5
378.6	367.5	364.2	1.0	0.0	0.375	49.9	70.0	23.6	73.8	378.6	1.0	0.0	0.686	50.0	73.1	10.3	73.8	8	1.0	0.0	0.375	1.0	0.0	0.722	49.9	74.4	5.2	74.6	4	1.0	0.0	0.375
384.8	375.0	371.3	1.0	0.0	0.25	50.1	68.7	31.8	75.6	384.8	1.0	0.0	0.457	50.1	71.1	19.0	73.6	15	1.0	0.0	0.25	1.0	0.0	0.559	50.1	72.2	14.0	73.6	11	1.0	0.0	0.25
390.2	382.5	378.4	1.0	0.0	0.125	50.3	68.3	39.8	79.0	390.2	1.0	0.0	0.287	50.1	69.1	29.3	75.1	23	1.0	0.0	0.125	1.0	0.0	0.389	49.9	70.2	22.8	73.8	18	1.0	0.0	0.125
393.3	390.0	385.5	1.0	0.0	0.0	50.2	68.1	44.7	81.5	393.3	1.0	0.0	0.13	50.3	68.3	39.4	78.9	30	1.0	0.0	0.0	1.0	0.0	0.246	50.1	68.7	32.0	75.8	25	1.0	0.0	0.0

*rgb**dd *rgb**ds *rgb**de

no continues hue change of device near $h_{ab,d}$ = 144,256
or *rgbd = 0.125, 1.0; 0.0; 0.0, 0.125, 1.0**
no correction done

See original or copy: http://web.me.com/klaus.richter/OE29/OE29L0NA.TXT /.PS
Technical information: http://www.ps.bam.de or http://130.149.60.45/~farbmetrik
TUB registration: 20110301-OE29/OE29L0NA.TXT /.PS
application for measurement of printer or monitor systems
TUB material: code=rha4ta