

Development of relative device and visual colour spaces sRGB & RGB*

Time scale	IEC: Display manufacturers and standard documents	CIE: Visual observers and standard documents
1950–1999	Colour television and colour CRT devices 4 display device colours $RYGB_d$ CIELAB hue angles = 40, 102, 136, 306	Visual colour space CIELAB 1976 $L^*, C^*_{ab}, h_{ab} = g_n(XYZ)$ (CIE metric) (g_n = nonlinear function) Color rendering CIE 13 Test colours no. 9 to 12 = $RYGB$ CIELAB hue angles = 26, 92, 162, 272
2000–2009	sRGB (display) standard $rgb = f_n(XYZ, L^*)$ (sRGB metric?) (f_n = nonlinear function) (the sRGB metric allows much freedom) IEC 61966–2–1 (sRGB standard) IEC 61966–X	relative device CIELAB space $rgb^*_{d} = f_i(L^*, C^*_{ab}, h_{ab,d})$ (CIE metric) (f_i = linear function, d = any device) DIN 33866–1 to 5, JIS 6933 ISO/IEC 15775, ISO/IEC TR 24705 ISO 9241–306:2009 Linearized display output for 8 room light reflections
2010–20??	IEC 61966–1 to 12	relative elementary CIELAB space CIE R1–47: CIE 13, no. 9 to 12 = $RYGB_e$ $rgb^*_{e} = g_i(L^*, C^*_{ab}, h_{ab,e})$ (CIE metric) (g_i = linear function, e = elementary) DIN 33872–1 to 6 -> ISO/CIE ?

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UE170-3N

Color space CIELAB 1976, color values, -attributes, -chromaticities (a^*, b^*)

tristimulus values X, Y, Z -> color attributes L^*, a^*, b^*

$$\begin{aligned}\text{lightness} \quad L^* &= 116 (Y/Y_n)^{1/3} - 16 \\ \text{RG-chromaticness} \quad a^* &= 500 [(X/X_n)^{1/3} - (Y/Y_n)^{1/3}] = 500 [a' - a'_n] Y^{1/3} \\ \text{JB-chromaticness} \quad b^* &= 200 [(Y/Y_n)^{1/3} - (Z/Z_n)^{1/3}] = 500 [b' - b'_n] Y^{1/3}\end{aligned}$$

color attributes L^*, a^*, b^* -> tristimulus values X, Y, Z

$$\begin{aligned}\text{tristimulus values} \quad X &= X_n [(L^* + 16) / 116 + a^*/500]^3 \\ Y &= Y_n [(L^* + 16) / 116]^3 \\ Z &= Z_n [(L^* + 16) / 116 - b^*/200]^3\end{aligned}$$

chromaticity for CIELAB 1976, LABHNU 1977, LABHNU1 1979

CIELAB 1976, 2°	$a' = 0,2191 (x/y)^{1/3}$	$b' = -0,08376 (z/y)^{1/3}$
LABHNU 1977	$a' = (x/y + 1/6)^{1/3} / 4$	$b' = -(z/y + 1/6)^{1/3} / 12$
LABHNU1 1979	$a' = (x/y + 1) / 15 \quad \text{linear!}$	$b' = -(z/y + 1/6)^{1/3} / 12$
LABHNU2 1979	$a' = (x/y + 1/6)^{2/3} / 15$	$b' = -(z/y + 1/6)^{1/3} / 12$
CIELAB 1976, 10°	$a' = 0,2193 (x_{10}/y_{10})^{1/3}$	$b' = -0,08417 (z_{10}/y_{10})^{1/3}$
chromaticity constants	$a_2 = 500 (1/X_n)^{1/3} = 0,2191$	$b_2 = -200 (1/Z_n)^{1/3} = -0,08376$
CIELAB, 2°, 10°	$a_{10} = 500 (1/X_{n10})^{1/3} = 0,2193$	$b_{10} = -200 (1/Z_{n10})^{1/3} = -0,08417$

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UE170-7N

TUB-test chart UE17; Colour spaces sRGB and RGB*
Development of colour spaces and basic CIE data

basic and mixed additive optimal colours for illuminant D65

basic colour or mixed colour and name	CIE standard chromaticity		CIE standard tristimulus values		
	x	y	X	Y	Z
three additive basic optimal colours:					
O orangered	0,6695	0,3302	42,65	21,04	0,02
L leafgreen	0,2991	0,6351	34,87	74,04	7,67
V violetblue	0,1445	0,0393	18,06	4,90	102,02
three additive mixed optimal colours:					
C cyanblue	0,2191	0,3268	52,94	78,96	109,70
M magentared	0,3218	0,1375	60,73	25,95	102,04
Y yellow	0,4300	0,5274	77,53	95,09	7,69
D65 (white)	0,3131	0,3275	95,60	100,00	109,71

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basic and mixed additive optimal colours normalized for illuminant D65

basic colour or mixed colour and name	Range 01 normalized chromaticity		Range 01 normalized tristimulus values		
	x_{01}	y_{01}	X_{01}	Y_{01}	Z_{01}
three additive basic optimal colours:					
O orangered	0,6792	0,3304	0,4461	0,2105	0,0002
L leafgreen	0,3102	0,6295	0,3649	0,7405	0,0709
V violetblue	0,1620	0,0420	0,1890	0,0490	0,9289
three additive mixed optimal colours:					
C cyanblue	0,2364	0,3369	0,5539	0,7895	0,9998
M magentared	0,3479	0,1423	0,6351	0,2595	0,9291
Y yellow	0,4424	0,5188	0,8110	0,9510	0,0711
D65 (white)	0,3333	0,3333	1,0000	1,0000	1,0000

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input: w/rgb/cmyk -> w/rgb/cmyk-
output: no change