

color space CIELAB 1976, color values, -attributes, -chromaticities (a' , b')

tristimulus values X , Y , Z $\rightarrow$ color attributes L^* , a^* , b^*

$$\text{lightness} \quad L^* = 116 (Y/Y_n)^{1/3} - 16$$

$$RG \text{ chromaticness} \quad a^* = 500 [(X/X_n)^{1/3} - (Y/Y_n)^{1/3}] = 500 [a' - a'_n] Y^{1/3}$$

$$JB \text{ chromaticness} \quad b^* = 200 [(Y/Y_n)^{1/3} - (Z/Z_n)^{1/3}] = 500 [b' - b'_n] Y^{1/3}$$

color attributes L^* , a^* , b^* $\rightarrow$ tristimulus values X , Y , Z

$$\text{tristimulus values} \quad X = X_n [(L^* + 16) / 116 + a^*/500]^3$$

$$Y = Y_n [(L^* + 16) / 116]^3$$

$$Z = Z_n [(L^* + 16) / 116 - b^*/200]^3$$

chromaticity for CIELAB 1976, LABHNU 1977, LABHNU_x 1979

$$\text{CIELAB 1976, } 2^0 \quad a' = 0,2191 (x/y)^{1/3} \quad b' = -0,08376 (z/y)^{1/3}$$

$$\text{LABHNU 1977} \quad a' = (x/y + 1/6)^{1/3} / 4 \quad b' = -(z/y + 1/6)^{1/3} / 12$$

$$\text{LABHNU1 1979} \quad a' = (x/y + 1) / 15 \text{ linear!} \quad b' = -(z/y + 1/6)^{1/3} / 12$$

$$\text{LABHNU2 1979} \quad a' = (x/y + 1/6)^{2/3} / 15 \quad b' = -(z/y + 1/6)^{1/3} / 12$$

$$\text{CIELAB 1976, } 10^0 \quad a' = 0,2193 (x_{10} / y_{10})^{1/3} \quad b' = -0,08417 (z_{10} / y_{10})^{1/3}$$

$$\text{chromaticity constants} \quad a_2 = 500 (1/X_n)^{1/3} = 0,2191 \quad b_2 = -200 (1/Z_n)^{1/3} = -0,08376$$

$$\text{CIELAB, } 2^0, 10^0 \quad a_{10} = 500 (1/X_{n,10})^{1/3} = 0,2193 \quad b_{10} = -200 (1/Z_{n,10})^{1/3} = -0,08417$$