CIELAB lightness L^*, tristimulus value discrimination dY, contrast (Y/dY), and sensitivity(dY/Y)

CIELAB lightness for all colours, $L^*_u=50$ for $Y_u=18$

$$L^* = 66\,(Y/Y_u)^{1/3} - 16 \qquad (Y_u=18,\ Y > 1)$$

For the grey discrimination we get:

$$dL^*/dY = (66/Y_u)\,(1/3)\,(Y/Y_u)^{-2/3}$$

and for $dL^*=1$ (about 3 thresholds) we can write:

$$dY = 3\,(Y_u/66)\,(Y/Y_u)^{2/3}$$

or

$$\log(dY) = \log(3\,(Y_u/66)) + (2/3)\log(Y/Y_u)$$

therefore in a log-log diagram the slope is (2/3).

for the CIE contrast sensitivity, and for $dL^* = 1$ it is valid:

$$Y/dY = (1/3)\,(66/Y_u)\,(Y/Y_u)^{1/3}$$

or

$$\log(Y/dY) = \log((1/3)\,(66/Y_u)) + (1/3)\log(Y/Y_u)$$

hea01−5a, eer30−1n

CIELAB lightness L^*, CIE tristimulus value discrimination $dY$and CIE contrast sensitivity (Y/dY)

CIELAB lightness for all colours, $L^*_w=100$ for $Y_w=100$

$$L^* = 116\,(Y/Y_n)^{1/3} - 16 \qquad (Y_n=100,\ Y > 1)$$

For the grey discrimination we get:

$$dL^*/dY = (116/Y_n)\,(1/3)\,(Y/Y_n)^{-2/3}$$

and for $dL^*=1$ (about 3 thresholds) we can write:

$$dY = (3(Y_n^{1/3})/116)\,(Y)^{2/3}$$

or

$$\log(dY) = \log(3(Y_n^{1/3})/116) + (2/3)\log(Y)$$

therefore in a log-log diagram the slope is (2/3).

for the CIE contrast sensitivity, and for $dL^* = 1$ it is valid:

$$Y/dY = (1/3)\,(116/(Y_n^{1/3}))\,Y^{1/3}$$

or

$$\log(Y/dY) = \log((1/3)\,(116/(Y_n^{1/3}))) + (1/3)\log(Y)$$

hea01−6a, eer30−2n

IECsRGB-triangle lightness T^*, CIE tristimulus value discrimination dY and CIE contrast (Y/dY) sRGB: see IEC 61966-2-1

$T^*_{sRGB,100} = 100\,(Y/Y_n)^{1/2,4}$ is an approximation of L^*_{CIELAB}

sRGB-triangle lightness for *achromatic* colours: W

$$T^*_{sRGB,100} = 100\,(Y/Y_n)^{1/2,4} \qquad (Y_n=100)$$

For the grey discrimination we get:

$$dT^*_{sRGB,100}/dY = (1/2,4)\,(Y/Y_n)^{-1,4/2,4} = 0,42\,(Y/Y_n)^{-0,58}$$

and for $dT^*_{sRGB,100}=1$ (about 3 thresholds) we can write:

$$dY = 2,4\,(Y/Y_n)^{1,4/2,4}$$

or

$$\log(dY) = \log(2,4) + (1,4/2,4)\log(Y/Y_n)$$

therefore in a log-log diagram the slope is 1,4/2,4.

for the CIE contrast sensitivity, and for $dT^*_{sRGB,100}=1$:

$$Y/dY = (Y_n^{1,4/2,4}/2,4)\,(Y/Y_n)^{1/2,4}$$

or

$$\log(Y/dY) = \log(Y_n^{1,4/2,4}/2,4) + 1/2,4\,\log(Y/Y_n)$$

hea01−7a, eer31−1n

IECsRGB-triangle lightness T^*, CIE tristimulus value discrimination dY and CIE contrast (Y/dY) sRGB: see IEC 61966-2-1

$T^*_{sRGB,100} = 100\,(Y/Y_n)^{1/2,4}$ is an approximation of L^*_{CIELAB}

sRGB-triangle lightness for *chromatic* colours: RGB

$$T^*_{sRGB,100} = 100\,(Y/Y_n)^{1/2,4}\ (Y_n=22(R),\ =71(G),\ =07(B))$$

For the discrimination we get:

$$dT^*_{sRGB,100}/dY = (1/2,4)\,(Y/Y_n)^{-1,4/2,4} = 0,42\,(Y/Y_n)^{-0,58}$$

and for $dT^*_{sRGB,100}=1$ (about 3 thresholds) we can write:

$$dY = 2,4\,(Y/Y_n)^{1,4/2,4}$$

or

$$\log(dY) = \log(2,4) + (1,4/2,4)\log(Y/Y_n)$$

therefore in a log-log diagram the slope is 1,4/2,4.

for the CIE contrast sensitivity, and for $dT^*_{sRGB,100}=1$:

$$Y/dY = (Y_n^{1,4/2,4}/2,4)\,(Y/Y_n)^{1/2,4}$$

or

$$\log(Y/dY) = \log(Y_n^{1,4/2,4}/2,4) + 1/2,4\,\log(Y/Y_n)$$

hea01−8a, eer31−2n

hea01−7n