sensation scaling functions
lightness L^* and tristimulus value Y

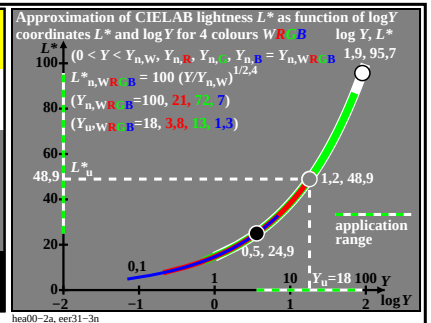
adaptation on surround white W
$L^*_W = 100\ (\ Y / 100)^{1/2,0}$

adaptation on surround grey U
$L^*_{IECsRGB} = 100\ (\ Y / 100)^{1/2,4}$

description with CIELAB 1976
$L^*_{CIELAB} = 116\ (\ Y / 100)^{1/3,0} - 16$

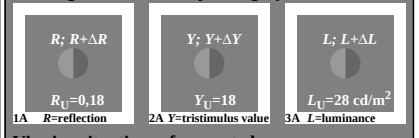
adaptation on surround black N
$L^*_N = 100\ (\ Y / 100)^{1/3,0}$

hea00−1a, eea00−4n, CEA10−4N

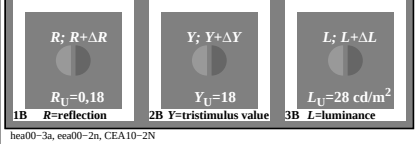


hea00−2a, eer31−3n

Viewing situations of adjacent greys

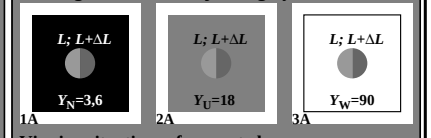


Viewing situations of separated greys

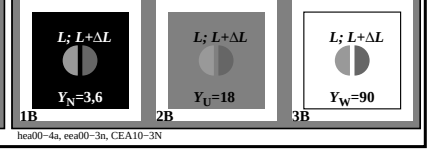


hea00−3a, eea00−2n, CEA10−2N

Viewing situations of adjacent greys

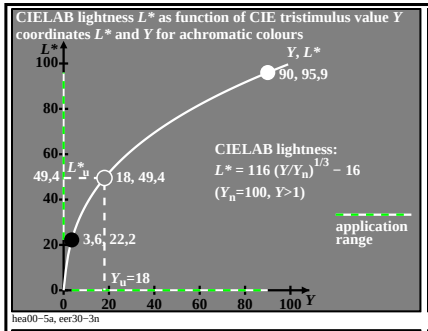


Viewing situations of separated greys

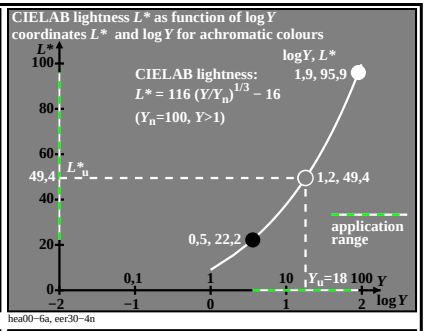


hea00−4a, eea00−3n, CEA10−3N

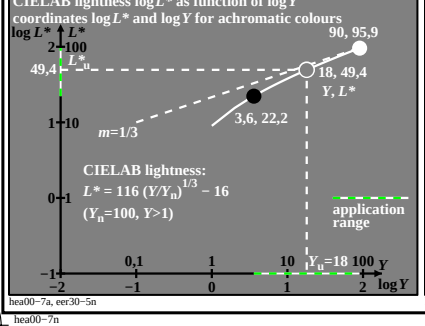
hea00−3n



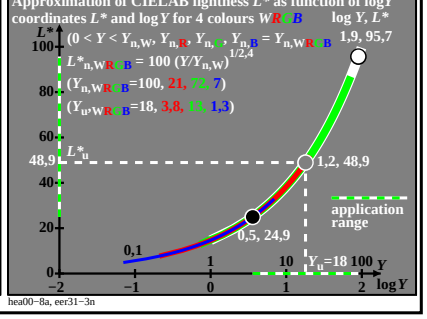
hea00−5a, eer30−3n



hea00−6a, eer30−4n

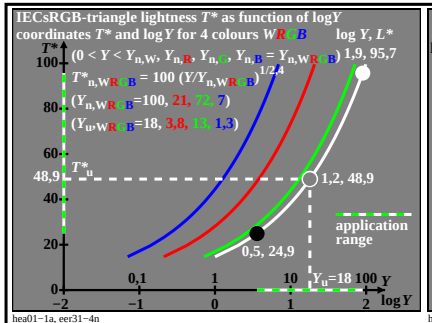


hea00−7a, eer30−5n

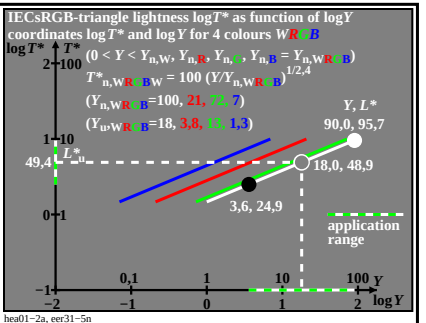


hea00−8a, eer31−3n

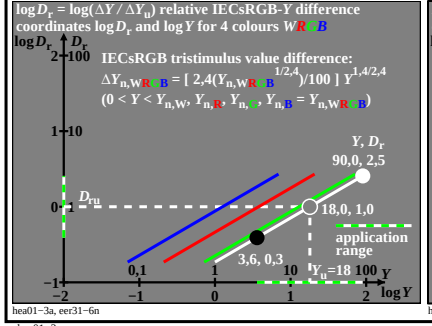
hea00−7n



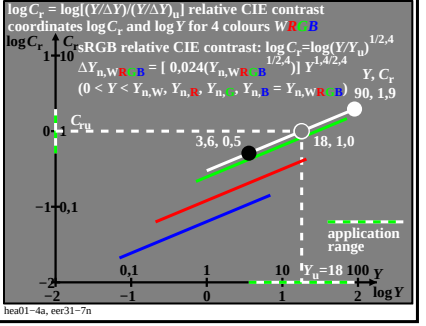
hea01−1a, eer31−4n



hea01−2a, eer31−5n



hea01−3a, eer31−6n



hea01−4a, eer31−7n

hea01−3n

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
$L^* = 66\ (Y/Y_u)^{1/3} - 16$ (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
$L^* = 116\ (Y/Y_n)^{1/3} - 16$ (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
$T^*_{sRGB,100} = 100\ (Y/Y_n)^{1/2,4}$ (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